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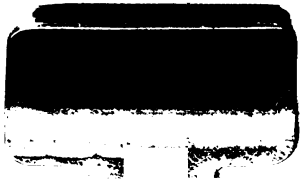
OF

SCIENCES, ARTS, AND LETTERS



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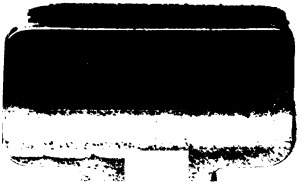

SYSTEMATIC LISTS

ILLUSTRATIVE OF THE

Flora, Fauna, Palæontology,

AND

Archæology

OF THE

NORTH OF IRELAND.

BY MEMBERS OF

The Belfast Naturalists' Field Club.

VOL. II.

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PREFACE.

SINCE the issue of Volume I. of the Systematic Lists, the production of these has somewhat fallen off, and it has been considered advisable by the Committee that the second volume should now be compiled.

The eight papers constituting this volume have been already distributed, as Appendices to the Club's Proceedings, to members in the various years of their publication. Following precedent they have been paged so that they might be bound into a separate volume which would be available to members joining the Club since their circulation, and to the general public.

It is hoped that further Systematic Lists dealing with the Natural History of the North of Ireland will shortly be forthcoming, as several members have been actively engaged in collecting the necessary material for the compilation of such lists.

PUBLICATION SUB-COMMITTEE.

BELFAST, *June*, 1911

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APPENDIX I.

VOL. II.

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THE FERNS OF ULSTER.

BY WILLIAM H. PHILLIPS AND ROBERT LLOYD PRAEGER,
B.E., B.A.

PUBLISHED BY
THE BELFAST NATURALISTS' FIELD CLUB.
January, 1887.

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1885-86.)

The Ferns of Ulster.

By William H. Phillips and Robert Lloyd Praeger, B.E., B.A.

IN submitting the following list of the species and varieties of our local Ferns to the members of the Belfast Naturalists' Field Club, we cannot but regret the absence in our district of other observers in this branch of natural science. The study of the varieties of British Ferns is most interesting and fascinating—being half botany, half horticulture, since the finds must be grown in order to be understood and correctly named—and is one which can be carried on with very little trouble or expense. Yet, beyond our own finds, we have been able only to come across a very few stray records. Thus, the counties of Armagh, Donegal, and Cavan are hardly represented at all in our localities for varieties, while the names of Antrim and Down occur in almost every line—those being the counties to which we most easily had access. This, however, only proves the richness of our district in varieties. Ferns there are, if only some one will find them. There is still a great field of discovery among our North of Ireland *Filices*. Already Ulster has yielded some splendid new varieties—among which we may mention *Athyrium Filix-fœmina crispum* and *Polystichum angulare divisilobum Crawfordiæ;* and many other treasures lie hidden away in our glens and copses only waiting to be found. At some future time we hope to bring out a supplement to this list, and we trust that then we shall have other names to record as finders of some of these beautiful varieties. The labour is small and the reward great. Nothing is more pleasant than to watch some wild find developing, under one's care, into an elegant decomposite or crested form. Again, a great advantage of Fern-hunting, as compared with most out-door scientific persuits, is that it can be carried on equally at every season of the year. For botany or entomology, for instance, there is but a short summer season; but not so among the Ferns; for while

in summer we can explore the *Athyriums* and *Lastreas* and *Blechnums* in our woods and on our mountain sides, in winter the evergreen fronds of *Polystichum* and *Scolopendrium* peep at us through the leafless hedges and wave luxuriantly in all our glens, inviting us to take up bag and trowel and go off Fern-hunting. We may add that we shall be very happy to give all the information in our power concerning this branch of botany to anyone asking it, or to name fronds sent to us, or to receive notes of new localities for species.

The district to which this list refers is bounded to the southward by the frontier line of Ulster, with the exception of the south-east and south-west corners, where in each case a slight encroachment has been made on an adjoining province. In the south-west a detour has been made in order to include the famous botanical region of Ben Bulben, in the extreme northern corner of Co. Sligo; and on the south-east our line has been drawn so as to include the Carlingford Mountains, in Co. Louth, which botanically, and in a less degree geologically, belong to the Mourne Mountains, in Co. Down. As regards the distribution of species in this area, few general observations can be made. *Asplenium marinum* and *Adiantum Capillus-Veneris* occur only along the coast line; the former being recorded from all our maritime counties, and growing in all suitable situations along our shores; the latter being confined to a limited area in Donegal.* *Polystichum angulare* haunts the low fertile districts in the east of the province, and is almost entirely unknown among the barren mountainous districts of Donegal and Fermanagh. In these latter, however, the Royal Fern, *Osmunda regalis*, occurs most plentifully, luxuriating in the rich peaty soil that surrounds the numerous lakes in those regions. *Polystichum lonchitis* and *Asplenium viride* are confined to the western counties; *Ophioglossum* loves the rich pastures of Down, Antrim, and Armagh. As Ulster plants, three of our Ferns are confined to Donegal; and it is a very strange thing that these three species, which are found only in the bleakest and most northern of all our counties, should be all southern plants. *Ophioglossum lusitanicum* is a plant of the Mediterranean coasts and the Canary Isles, whose only other British stations are Kerry and Guernsey. The Killarney Fern, *Trichomanes radicans*, principally haunts, as a British species, the shadiest rocks in the south and south-west of Ireland; and the Maidenhair, *Adiantum Capillus-Veneris*, makes its home in southern Europe and the north of Africa, occurring also on the south coast of England and in the south-west of Ireland. Some of the species, again, seem ubiquitous—*Athyrium Filix-fœmina*, *Polystichum aculeatum*, and *Lastrea Filix-mas* are examples—occurring equally in damp shady woods and glens, on open hedge-banks and roadsides, and on storm-swept mountains, where they flourish among the stones and rocks.

Of the 46 British and 33 Irish species of Ferns, our province yields 32—

* With the exception of a few plants found in Leitrim.

Asplenium lanceolatum being the only Irish Fern which does not occur in the district.* Of these 32 species, five may be accounted extremely rare, having been found in only one or two localities in the district; these are:—

Polypodium Dryopteris.
Lastrea spinulosa.
Adiantum Capillus-Veneris.
Trichomanes radicans.
Ophioglossum lusitanicum.

Five others may be called very rare, occurring as they do very sparingly in the province:—

Allosorus crispus.
Polystichum Lonchitis.
Lastrea Thelypteris.
Asplenium viride.
Hymenophyllum Tunbridgense.

Six more come under the head not common:—

Polypodium Phegopteris.
Lastrea Oreopteris.
Cystopteris fragilis.
Hymenophyllum Wilsoni.
Osmunda regalis.
Botrychium Lunaria.

Five under the head rather common:—

Lastrea æmula.
Polystichum aculeatum.
Ceterach officinarum.
Asplenium marinum.
Ophioglossum vulgatum.

And finally, eleven under the head common, being plentifully distributed through the district:—

Polypodium vulgare.
Lastrea Filix-mas.
——— *dilatata.*
Polystichum angulare.
Athyrium Filix-fœmina.
Asplenium Adiantum-nigrum.
——— *Trichomanes.*
——— *Ruta-muraria.*
Scolopendrium vulgare.
Blechnum spicant.
Pteris aquilina.

* It is confined to counties Cork and Kerry.

This grouping is, of course, only approximate, and if taken as referring to any particular county or district might give very erroneous results; but when taken as referring to Ulster as a whole, it will, we think, convey a pretty correct general idea of the distribution of our local Ferns.

In two instances—namely, when referring to *Lastrea Filix-mas* and to the divisilobe class of varieties of *Polystichum angulare*—we have departed from our course as compilers of a list in order to describe some new classification which has recently been adopted by the leading authorities on British Ferns. This is not to be found in any of our Fern manuals, and, we believe, will prove interesting to the botanists of the Club. We have been compelled, much against our will, to adopt an alphabetical arrangement of the varieties, since no scientific classification of them has been made, and we did not feel qualified to attempt this task ourselves. The British Pterodological Society performed a great service in classifying the varieties of *Polystichum angulare*, though unfortunately their results have not been published; but the *Athyriums*, *Lastreas*, and *Scolopendriums* still remain unarranged, waiting for some champion to arise to give each one its proper place in the world of Ferns.

In the difficult task of naming the varieties, we have obtained much valuable assistance from kind friends on the other side of the channel; among these we would specially mention Colonel Jones, of Bristol, and George B. Wollaston, Esq., of Chislehurst, to both of whom we are deeply indebted, both for naming fronds submitted to them, and for sending us plants and fronds of English forms of our varieties. From the beautiful nature-printed plates of varieties of British Ferns, brought out by Colonel Jones, under the auspices of the British Pterodological Society, we have abstracted our notes on *Lastrea Filix-mas* and *Polystichum angulare proliferum*, and have derived much other assistance. To Mr. S. A. Stewart, F.B.S.E., we also owe many thanks for information supplied as to localities for species.

As to the distribution of varieties very little can be said. The varieties of Ferns are peculiar, in as much as they generally occur as isolated plants. Occasionally a little colony of some variety is discovered; but usually a single plant is all that is obtained in any one place. A few of the exceptions to this rule we may mention:—

P. angulare capitatum has been known to grow in Ballygomartin Glen, near Belfast, for some twenty years; and in spite of frequent depredations, may still be found there. The *Irish Polypody* is a striking exception, as it generally occurs in considerable quantity where it occurs at all. The ditches about Ballymenoch, Holywood, have long yielded examples of *P. angulare interruptum*. On sea-cliffs near Torr Head, in Co. Antrim, this summer, we discovered a large colony of very curious interrupted forms of *Athyrium Filix-fœmina;* and many other instances might be quoted. But the most noteworthy example occurs on the Mourne Mountains, where two very interesting varieties of *Blechnum*, *trinervium* and *anomalum*, occur in hundreds on

the hill-sides; yet we have no record of either of these forms having been found in any other locality in Ulster.

In conclusion, we may say a few words as to the times at which the various observers, whose names occur in the following pages, lived and laboured in the cause of science. Mr. Templeton was the great pioneer of Ulster botany, and the accuracy and care displayed in his notes have excited the admiration of all who have followed in his wake; most of his records date between 1780 and 1810. After him came Messrs. Thompson, Whitla, and Hyndman (about 1820 to 1840), each of whom contributed his share towards the knowledge of our local flora. Other names which frequently occur in the "Flora of Ulster" (1864), from which we have extracted many notes, are those of Messrs. Ferguson, Millen, and Orr, and that of the author, Dr. Dickie. Following many of the localities in this list will be found the names of Dr. Mackay and Dr. Moore, each of whom did so much good work in the cause of Irish botany. More recent observers, whose names often occur in this list, are Messrs. S. A. Stewart, H. C. Hart, and R. M. Barrington. After each locality we have given, as far as we were able, the name of the original finder; and where the plant has been since observed there we generally mention it.

1. POLYPODIUM. POLYPODY.

1. P. VULGARE. **Common Polypody.**

Rocks, walls, trees, and woods—plentiful throughout the district. Ascends to about 1000 feet on the mountains. On summit of Ben Bulben (1721 feet), T. H. Corry.

adpressum.

Craigauntlet, Co. Down, R. Ll. P.

bifidum.

Castlereagh, Co. Down, W. H. P. and R. Ll. P. Holywood hills, Co Down, R. Ll. P.

denticulatum.

Lough Gill, Co. Sligo, Moore's N.P. Ferns. Knockagh, Co. Antrim, R. Ll. P.

rotundatum.

Near Knockmore, Co. Fermanagh, W. H. P.

semilacerum (*Irish Polypody*).

Co. Antrim.—Redhall Glen, Templeton; Glenoe and Islandmagee, R. N. F. C.; east branch of Woodburn glen, T. H. Corry; Garron Point

and Knockagh, R. Ll. P. Near Knockmore, Co. Fermanagh, W. H. P. Island in Lough Erne, Co. Donegal, T. H. Corry. Redhall and Glenoe are two well-known stations for this handsome variety, and at both it grows abundantly and luxuriantly; in the latter place we have measured fronds 1½ foot long by 9 inches broad. It is almost confined to Co. Antrim—doubtless the limestone is the attraction there, but why is it so rare in other limestone tracts?

2. P. PHEGOPTERIS. **Beech Fern.**

Damp rocks and banks. Not common.

Ascends to over 2000 feet in the mountains. At 2400 feet on Slieve Bingian.

Antrim.—North branch of Glenarve river, Templeton, 1809. On Slievenanee, and in Glendun, Rev. S. A. Brenan. Glenariff, W. H. P., R. Ll. P., &c. By waterfall on Inver river above Glenariff, and by the Carnlough and Linford rivers, and on Trostan, R. Ll. P.

Down.—Two miles south of Slieve Croob, and on Slieve Bingian, Templeton (and later in latter station, Rev. H. W. Lett and R. Ll. P). Black mountain, above Tollymore Park, W. Thompson; (since observed there, Rev. H. W. Lett, W. H. P. and R. Ll. P.) Rostrevor, Rev. George Robinson. On Slieve Donard and Slieve Commedagh, S. A. Stewart. Luke's mountain, W.H.P. Sparingly near Craigauntlet above Holywood, and on Slieve Bearnagh, Slieve-na-glough, and Thomas mountain, R.Ll.P.

Louth.—Carlingford mountain, Robt. Browne, 1801, and since by B.N.F.C., Rev. H. W. Lett, W. H. P. and R. Ll. P.

Armagh.—Frequent on rocks on N.E. slope of Slieve Gullion, Rev. H. W. Lett.

Derry.—Ness Glen, Templeton. By the Owenrigh river, near Banagher, S. A. Stewart. Near Dungiven, B.N.F.C., 1872.

Donegal.—Lough Eske, Mackay. Near Killybegs, A. G. More. Glenalla, Carradoan, Angterlinn, Croghanmore, Poisoned Glen, Banagher mountain, Glenveigh, Alt mountain near Ardara, near Lough Finn, Milford, woods by coast between Slieve-a-tooey and Magheragh, and at 2000 feet on Slieve Snacht West, H. C. Hart. Crockaughrim, Charles Moore.

Tyrone.—Strabane Glen, W. H. P.

Fermanagh.—Near Brookeborough, Rev. S. A. Brenan.

3. P. DRYOPTERIS. **Oak Fern.**

Shady places on mountains. Extremely rare.

Antrim.—North side of Knocklayd, Cybele Hibernica. Since a single plant of this fern was discovered by Dr. Moore in the above locality nearly half a century ago, it has not been observed in the North of Ireland, and we very much doubt if it can now be reckoned among our local ferns.

[**P. ROBERTIANUM** is reported to have been found on Carlingford Mountain, Co. Louth, but this is very unlikely, and requires ample confirmation.]

2. ALLOSORUS. ROCK-BRAKE.

1. A. CRISPUS. **Parsley Fern.**

Rocky places on mountains. Very rare.

Antrim.—Knocklayd and Carrickfergus Commons, David Moore. South brow of Slievenanee at 1500 feet, Dr. Dickie—since observed in above station by T. H. Corry and Rev. S. A. Brenan.

Down.—On Slieve Bingian, Templeton, 1808—and recently, Rev. H. W. Lett and R. Ll. P. On Shanslieve, Slieve-na-brock, and north side of Slieve Donard, Rev. H. W. Lett. Near the Eagle Rock, on the road from Hilltown to Kilkeel, Mr. Barcroft. On south side of Slieve Donard, and on the mountain north of Cove mountain, R. Ll. P.

Louth.—Carlingford mountain, very rare, B.N.F.C., 1878.

Derry.—Clontygearagh mountain, David Moore.

Donegal.—Very sparingly on Alt mountain near Ardara, H. C. Hart.

Fermanagh.—On Cuilcagh mountain near Florencecourt, John M'Donald. Very rare and scanty in the district, only isolated plants occurring here and there.

3. LASTREA.

1. L. THELYPTERIS. **Marsh Fern.**

Wet places. Very rare.

Antrim.—Plentiful about Portmore Park and wood, Templeton, 1794. Banks of Six-mile water near Ballyclare, G. C. Hyndman and F. Whitla.

Donegal.—By the river Erne near Ballyshannon, A. G. More. By the same river near Belleek, H. C. Hart.

Tyrone.—By a small lake near Caledon Rectory, Rev. G. Armstrong. At Omagh and Gorteen Gap, G. H. Kinahan.

Cavan.—Near Belturbet, David Moore.

Donegal and Tyrone are the only counties where this fern has been recently found; it is very strange how it has died out at Portmore.

2. L. ORMOPTERIS. **Mountain Fern.**

Banks and mountain pastures. Not common, and very local.

Antrim.—At the base of the hill above Carrickfergus, J. Rea. Glendun, B.N.F.C., 1879—a well-known locality, where it grows in great profusion. Glenshesk, behind Ballycastle, Dr. O'Connor. Glenarm Deerpark, south side of Glenariff, at Culraney north of Runabay Head, in Glenaan, and near Cushendall, R. Ll. P.

Down.—Tollymore Park, Templeton, 1805—often since recorded from this station. Thomas mountain, W. H. P. In various places about Newcastle, W. H. P., R. Ll. P., &c. Luke's mountain, and near Moneyscalp plantation west of Bryansford, and on the Holywood hills, R. Ll. P. Very rare in last locality.

Armagh.—On Ferry Hill above Narrow Water, R. Ll. P.

Derry.—Bennedy near Dungiven, David Moore. Cushcapel near Dungiven, and on Slieve Gallion near Desertmartin, S. A. Stewart. Moyola Park at Castledawson, B.N.F.C. Mullaghmore, H. C. Hart. Lignapeiste, W. H. P.

Donegal.—Milroy Bay, Newman. Gap of Barnesmore, W. Thompson. Killybegs, and near Lough Eske, R. Barrington. Mintiagh, Charles Moore. Near Black Gap, T. H. Corry. Banks of Eske river, Glen river, Lough head river, and Reelan water, at Glenveigh and Bunlinn, and plentiful in glens in Innishowen, H. C. Hart. Near Buncrana, W. H. P.

Tyrone.—Strabane Glen, W. H. P.

Leitrim.—South side of Glenade mountain, R. Barrington and R. P. Vowell.

interrupta. Glendun, Co. Antrim, R. Ll. P.

revolvens. Newcastle, Co. Down, W. H. P.

3. L. FILIX-MAS. **Male Fern.**

It is now generally admitted that this species as described by Presl includes three distinct forms, which are elevated to the rank of species by Mr. Wollaston. We append the most obvious of their characters as briefly as possible under their several heads.

A. Propinqua-mas (*Wollaston*). (*Filix-mas abbreviata, Moore.*) (Fronds and pinnæ concave, pinnules biserrate, colour dull pale green; perfectly deciduous, texture soft; indusium embracing spore-cases, persistent, entire).

Dry hedge-banks and woods. Extremely rare.

Near Carngaver, Co. Down, R. Ll. P., 1882.

B. Filix-mas (*Presl*). (Fronds and pinnæ convex, pinnules serrate or biserrate; colour shiny pale green; texture papery; very partially deciduous; indusium not embracing spore-cases, eventually evanescent, disrupted).

Woods, glens, roadsides, &c. Common.

argentea. (Record lost), W. H. P. A white variegation.
confluens. Ligoniel, Co. Antrim, W. H. P.
flava. (Record lost), W. H. P. A yellow variegation.
interrupta. Castlereagh, Holywood, Newcastle, Cushendall, &c.—a common but inconstant variety.

C. Pseudo-mas (*Wollaston*). (*Filix-mas paleacea, Moore*). (Fronds and pinnæ plane, pinnules entire or very slightly toothed, colour bright yellowish green when young, deep shining green when mature; rachis thickly clothed with rich golden-brown scales; texture coriaceous; evergreen or sub-evergreen; indusium embracing spore-cases, persistent, entire.

Woods, hedges, and wastes. Common.
crispata. Holywood and Castlereagh, Co. Down, W. H. P. The Rock, Co. Tyrone, Rev. S. A. Brenan.
cristata. Upper Cultra Wood, Co Down, Robert Milligan—a very good find.
foliosa. Newcastle, Co. Down, W. H. P.
interrupta. Castlereagh, Holywood, Dundonald, &c.—like *Filix-mas interrupta*, a common but inconstant form.
monstrosa. Holywood, Co. Down, W. H. P. An extreme form of *interrupta*, but constant.
polydactyla. Newcastle, Co. Down, W. H. P.

4. L. DILATATA. **Broad Buckler Fern.**

Woods, rocks, hedges, &c. Abundant.

Occurring in all situations throughout the district. Of all our local ferns, this is the one which occurs at the greatest altitude on the mountains, ascending even higher than Blechnum. On the Mourne mountains, we have observed it up to over 2000 feet. At nearly 2500 on Slieve Donard.

interrupta. Holywood waterworks, Co. Down, R. Ll. P.
truncata. Holywood hills, and Dundonald, Co. Down, R. Ll. P.

5. L. SPINULOSA.

Damp shady places. Extremely rare.

Derry.—Frequent by the river Roe near Dungiven, David Moore. Dr. Moore sent specimens to England and had his find confirmed by Thomas Moore of Chelsea. This is the only record of this fern in Ulster which we consider perfectly reliable: forms of *L. Dilatata* are often mistaken for it.

6. L. ÆMULA. **Bree's Fern.**

Damp woods and hedgebanks. Generally distributed but not common. Ascends to about 1000 feet.

Antrim.—Cushendall, Moore's N.P. Ferns. Among heather at 1000 feet on the summit of Carnaneigh, and plentiful in the wood at Murlough Bay, R. Ll. P.

Down.—Slieve Donard and sandhills at Dundrum, Dr. Dickie. Rademon Demesne and near Tyrella, C. Dickson. Cultra, W. Millen, and later, W. H. P.—now extinct. Drumbo Glen, Alexander Robertson. Plentiful in Tollymore Park—a well-known station—and near the Spa, Ballynahinch, W. H. P. Near Dunbeg Lake N.W. of Ballynahinch, and sparingly near Newtownards and Dundondald, R. Ll. P.

Louth.—By the Two-Mile River on Carlingford Mountain, R. Ll. P.

Armagh.—Plentiful in the woods on Ferry Hill above Narrow Water, R. Ll. P.

Derry.—Coleraine, Moore's N. P. Ferns. Garvagh, David Moore. On an old bank inland from Portrush, W. H. P.

Donegal.—Milroy Bay, Lough Derg, Lough Swilly and Errigal Mountain, Moore's N. P. Ferns. Killybegs and Lough Eske, R. Barrington. Innishowen Head, Aran Island, and in woods near Carndonagh, and at Glenalla, Rathmullen, and Carrablagh, H. C. Hart. Buncrana, W. H. P.

Tyrone.—Strabane Glen and Sion Mills, W. H. P. Near Pomeroy, S. A. Stewart.

Fermanagh.—Near Pollaphuca, R. Barrington. Carrick and Drumbad, S. A. Stewart. Frequent in the county, W. H. P.

Cavan.—Lough Sheelin, and by the R. Erne at Lough Gowna, R. Ll. P.

Sligo.—Abundant on Ben Bulben; shores and islands of Lough Gill, W.H.P.

Leitrim.—Glencar and Glenade, R. Barrington and R. P. Vowell.

angustipinnula. Tollymore Park, Co. Down, W. H. P.

4. POLYSTICHUM. SHIELD FERN.

1. P. LONCHITIS. **Holly Fern.**

On mountains, among stones. Very rare.

Ascends to the summit of Ben Bulben (1721 feet), T. H. Corry.

Donegal.—Rosses and Fanet mountain passes,* and in a glen east of Lough Eske, David Moore. Slieve League, H. C. Hart.

Sligo.—On Ben Bulben and other mountains in County Sligo, Dr. Mackay, and later by S. A. Stewart and T. H. Corry.

Leitrim.—On the Glenade Mountains, W. H. P. Common in parts of Glenade, R. Barrington and R. P. Vowell.

2. P. ACULEATUM. **Prickly Shield Fern.**

Woods, hedgebanks, and stony places. Rather local. An upland fern.

Antrim.—Glenarm, Cushendall, &c., Templeton. Colin Glen, W. Thompson. Stoneyford, Wolfhill, Crow Glen, Lough Mourne, Woodburn, and

* "Having applied to Dr. Moore, I learn this was a mistake."—H. C. HART.

Larne, W. H. P.—Glynn, Glenarm Deerpark, Glendun, Glenariff, Carnlough, Murlough Bay, and Binnagee, R. Ll. P.

Down.—Tollymore Park, W. Thompson. Rademon Demesne, Cultra, and Hillsborough, W. H. P. Rostrevor, Clandeboye Demesne, Craigauntlet, Carngaver, and Crawfordsburn, R. Ll. P.

Louth.—By the Two-Mile River on Carlingford Mountain (*lobatum* form), R. Ll. P.

Armagh.—Near Tynan, W. H. P. On Ferry Hill, above Narrow Water, R. Ll. P.

Donegal.—By the River Erne opposite Cliff, and plentiful on Crockaughrim, H. C. Hart. Mintiagh, Charles Moore.

Tyrone.—Aughnacloy, G. H. Kinahan. Dungannon, W. H. P.

Fermanagh.—Not uncommon on the hills, S. A. Stewart. Plentiful in the county, W. H. P.

Monaghan.—Near Monaghan, W. H. P.

Cavan.—Not uncommon on the hills of North Cavan, S. A. Stewart.

furcans. At Tynan, Co. Armagh, and in Co. Fermanagh, W. H. P.

gracile. Co. Fermanagh, W. H. P.

The varieties *lobatum* and *lonchitioides* are of frequent occurrence, but we do not consider them very distinct.

3. P. ANGULARE. **Soft Shield Fern.**

Woods, glens, and hedgebanks. Plentiful.

Essentially a lowland fern—excepting one isolated plant, we have never found it at over 500 feet. Our district is very rich in varieties of this species, which, on account of their complicated nature, we have found some difficulty in naming correctly.

acutum. Glendevis, Co. Antrim, W. H. P. Cultra, Co. Down, R. Ll. P.

acutilobum. See *proliferum*.

attenuato-interruptum. Glenarm, Co. Antrim, R. Ll. P.

attenuato-furcans. Cultra, Co. Down, R. Ll. P.

brachiatum. Kilroot, Co. Antrim, W. H. P.

brachiato-cristatum. Castlecoole, Co. Fermanagh, W. H. P.

brachiato-decompositum. Crow Glen, Co. Antrim, W. H. P. Stormont, and Dundonald (*Tripinnatum Praeger, Jones*), Co. Down, R. Ll. P.

capitatum. Antrim Road and Springfield, Belfast, W. H. P. Holywood, Co. Down, R. Ll. P.

capitatum (*Ramulosum, Stansfield*). Glendevis, Co. Antrim, W. Gault, and later, W. H. P. and R. Ll. P. Clandeboye, Co. Down; and Strabane Glen, Co. Tyrone, W. H. P. Cultra, Dundonald, and Stormont, Co. Down; Castle Dobbs, Co. Antrim; and Lough Sheelin, Co. Cavan, R. Ll. P.

coriaceum. Castlereagh, Co. Down; and Springfield, Belfast, W. H. P.

cristatum. Dalchoolin, Co. Down; and Kilroot, Co. Antrim, W. H. P.

Holywood, and Stormont, Co. Down; and Castle Dobbs, Co. Antrim, R. Ll. P. Stormont Demesne has yielded two, and the Castle Dobbs neighbourhood no less than three, distinct forms of this rare variety.

cuneatum. Castlereagh, Co. Down; and Castlecoole, Co. Fermanagh, W. H. P. Carngaver, Dundonald, and Craigavad, Co. Down, R. Ll. P. The Craigavad form develops into *grandidens* in a very extraordinary way.

cuneato-setosum. Cave Hill, Co. Antrim; and Castlecoole, Co. Fermanagh, W. H. P. Two elegant forms.

decompositum. Cultra, Co. Down; Castle Dobbs, Co. Antrim; and Castlecoole, Co. Fermanagh, W. H. P. Stormont, Co. Down, R. Ll. P.

decompositum densum. Stormont, Co. Down, R. Ll. P.

decurrens. Cultra, Co. Down, R. Ll. P.

deltoideum. Crow Glen, Co. Antrim, W. H. P.

dentatum. Crow Glen, Co. Antrim, W. H. P. Craigauntlet, Co. Down, R. Ll. P.

divisilobum. See *proliferum*.

exile. Holywood, Co. Down, W. H. P.

frondosum. Castlereagh, Co. Down, W. H. P.

furcillatum. Finnebrogue, Co. Down, W. H. P.

gracile. Castlecoole, Co. Fermanagh, W. H. P.

grandiceps. Cave Hill, Co. Antrim, John Bland. A very rare variety; the Cave Hill plant is distinct from other forms of *grandiceps*.

grandidens. Co. Fermanagh, Rev. R. Eccles, and L. Erne, Rev. W. Bailey, Moore's N.P. Ferns. Craigavad, Co. Down, W. H. P. and R. Ll. P.

grandidens truncatum. Craigavad, Co. Down, R. Ll. P. Does not grow more than four inches high.

inaequale. Crow Glen, Co. Antrim, W. H. P. Castlereagh, Co. Down, W. H. P. and R. Ll. P. Cultra, Co. Down, R. Ll. P.

inaequale setosum. Glendevis, Co. Antrim, W. H. P.

incurvatum. Ormeau, Co. Down, W. H. P.

interruptum. Crawfordsburn, Co. Down; Lisburn and Springfield, Co. Antrim, W. H. P. Holywood, Co. Down, W. H. P. and R. Ll. P. Cultra and Dundonald, Co. Down; and Glenarm, Co. Antrim, R. Ll. P. Several different varieties appear to be included under this name. Thus, our Holywood plant is a symmetrical and pretty form, while that from Crawfordsburn, and much more some of the Devonshire forms of *interruptum*, are widely different, being very irregular and ragged.

interruptum caudatum. Glenarm Park, Co. Antrim, R. Ll. P.

interruptum setosum. Stormont, Co. Down, R. Ll. P.

irregulare. Holywood, Co. Down, W. H. P.

laciniatum. Holywood, Co. Down, W. H. P. Craigauntlet, Co. Down, R. Ll. P.

latifolium. Knock, Co. Down, R. Ll. P.

laxum. Castlereagh and Crossgar, Co. Down; and Kilroot, Co. Antrim, W. H. P. Dundonald and Cultra, Co. Down, R. Ll. P.

lineatum. Cultra, Co. Down, R. Ll. P. Has not, so far, proved constant.

multifidum. Dundonald, Co. Down, R. Ll. P.

multilobum laxum. Castle Dobbs, Co. Antrim, R. Ll. P.

perserratum. Glenarm, Co. Antrim, R. Ll. P.

polydactylum. Glendevis, Co. Antrim, W. H. P. Stormont, Co. Down, R. Ll. P.

proliferum. Following the classification of the leading pterodological authorities, we arrange this difficult and beautiful class of varieties under two heads—acutilobes and divisilobes. Mr. Wollaston thus characterises the two subdivisions:—

a. acutilobum. Tripinnate; all divisions of frond acute, anterior and posterior pinnules almost of same length.

b. divisilobum. Tripinnate; same as *acutilobum*, except that the anterior and posterior pinnules are of very unequal length, the latter far longer, and the divisions altogether more highly developed. A well-grown plant is subquadripinnate or even quadripinnate. Our district has so far yielded only a few of these beautiful varieties, but such as have been found eminently maintain its reputation as a first-class hunting-ground.

a. acutilobum. Castlereagh, Co. Down, W. H. P. Castle Dobbs, Co. Antrim, R. Ll. P.

b. divisilobum. Castlecoole, Co. Fermanagh, W. H. P. (*divisilobum laxum, Jones*). Characterized by Mr. Wollaston as "a gem of the first water."

divisilobum Crawfordiæ. (*proliferum Crawfordianum* of *Stansfield*). Crawfordsburn, Co. Down, Miss Crawford. This is the celebrated Crawfordsburn Fern, one of the most beautiful of a beautiful class, which was found near Crawfordsburn in 1861 by a labourer of Miss Crawford, only a single plant being discovered at the time, and in spite of frequent search it has never been found since. The plants usually sold as Crawfordsburn Ferns in the market are a far commoner form, viz.—*divisilobum Alchinii*. The genuine plant is found in very few collections; it is easily recognisable by the very broad and overlapping character of the pinnæ, and the extreme breadth of the fronds.

quadratum. Co. Antrim, A. Stansfield, Moore's N.P. Ferns.

retroflexum. Glenarm, Co. Antrim, R. Ll. P.

revolvens. Castleton, Co. Fermanagh, W. H. P.

rotundatum. Ligoniel, Co. Antrim; and Castlecoole, Co. Fermanagh, W. H. P. Craigavad, Co. Down, R. Ll. P. The first-mentioned is a splendid rotundate form; the others are not so distinct.

rotundo-interruptum. Holywood Hills, Co. Down, W. H. P. and R. Ll. P.

setosum. Castlereagh, Co. Down, W. H. P. Cultra, Co. Down, R. Ll. P.

setoso-gracile. Castlecoole, Co. Fermanagh, W. H. P.

setoso-variegatum. Castlereagh, Co. Down, W. H. P.

tripinnatum. Castle Dobbs, Co. Antrim, W. H. P. Holywood and Stormont, Co. Down, R. Ll. P.

truncatum. Colin Glen, Co. Antrim, W. H. P. Stormont, Craigauntlet, and Crawfordsburn, Co. Down, R. Ll. P. Truncate forms are not uncommon, but are generally inconstant; the Crawfordsburn plant is the best we have found.

varians. Holywood and Cultra, Co. Down, W. H. P.

variegatum. Dundonald, Co. Down, R. Ll. P. Variegated forms are extremely rare.

5. ATHYRIUM. LADY FERN.

1. A. FILIX-FŒMINA. **Common Lady Fern.**

Woods, hedgebanks, and mountains. Abundant and generally distributed. Occurs up to a considerable elevation on the mountains, growing in sheltered corners among stones.

adpressum. Cultra Wood, Co. Down, R. Ll. P.

apuseforme. Stormont, Co. Down, W. H. P. A very neat crested form.

conioides. Near Scrabo Hill, Co. Down, Du Noyer. Glenarm, Co. Antrim, R. Ll. P.

conioides multifidum. Above Holywood, Co. Down, Miss L. Munster. Near Craigauntlet, Co. Down, R. Ll. P. The Holywood Hills district has thus thrice yielded varieties of the *conioides* type.

cristatum. Bryansford, Bloody Bridge, and Cultra, Co. Down, W. H. P.

cristatum laxum. Ballynahinch, Co. Down, W. H. P.

crispum. On Orra More, Co. Antrim, A. Smith. This was the original discovery of this well-known and beautiful form, which is to be found in every collection.

cruciato-cristatum. Castlerock, Co. Derry, R. Ll. P. A very remarkable form.

cruciatse-pinnulse. Castlerock, Co. Derry, R. Ll. P. A very rare variety.

decompositum. Craigauntlet, Co. Down, R. Ll. P.

elegans. Duneight, Co. Antrim, Rev. W. D. Pounden. A beautiful form, approaching *plumosum*.

foliosum. Craigauntlet, Co. Down, R. Ll. P.

Frisellise. Seven Acres, Fanet, Co. Donegal, H. C. Hart. A very rare variety.

frondosum. Dundonald, Co. Down, W. H. P. Cushendun, Co. Antrim, R. Ll. P.

flechenioides. Colin Glen, Co. Antrim, W. H. P.

gracile. Inch near Downpatrick, Co. Down, W. H. P.

inæquale. Bryansford, Co. Down, and Killymoon, Co. Tyrone, W. H. P. Dundonald, Stormont, Holywood, Craigauntlet, and Newcastle, Co. Down; and Glenarm, Co. Antrim, R. Ll. P.

incisum. Killybegs, Co. Donegal, R. Barrington, Moore's N. P. Ferns.

interruptum. Carlingford Mountain, Co. Louth, W. H. P. Sea-cliffs south of Torr Head, Co. Antrim, R. Ll. P.

interruptum Phillips (*Clapham*). (*Cruciatæ-pinnulæ, Fox*). Holywood, Co. Down, W. H. P., 1864; and R. Ll. P., 1884. Newcastle, Co. Down, W. H. P. Garron Point, Co. Antrim, and Lough Sheelin, Co. Cavan, R. Ll. P.

laciniatum. Killybegs, Co. Donegal, R. Barrington, Moore's N. P. Ferns. Holywood, Co. Down; and Garron Point and Glenarm, Co. Antrim, R. Ll. P.

latifolium. Craigauntlet, Co. Down, R. Ll. P.

latifolium Praeger (*Wollaston*). Castlerock, Co. Derry, R. Ll. P.

multifidum. Dunmore, Co. Down, Wylie. Stormont, Co. Down, W. H. P. and R. Ll. P. Dundonald, Co. Down, R. Ll. P.

ramosum. In a cave at Newcastle, Co. Down, W. S. Johnston. Holywood, Co. Down, R. Ll. P.

rectangulare. Castlerock, Co. Derry, R. Ll. P.

reflexum. Rademon Demesne, Co. Down, W. H. P. Newcastle, Co. Down, R. Ll. P.

reflexum multifidum. Castlerock, Co. Derry, R. Ll. P.

reflexum furcatum. Dundonald, Co. Down, R. Ll. P.

rhæticum. Cushendall, Co. Antrim, David Moore. Killybegs, Co. Donegal, R. Barrington. We do not know the variety as a distinct form.

6. ASPLENIUM. SPLEENWORT.

1. A. ADIANTUM-NIGRUM. **Black Spleenwort.**

Old walls, dry banks, and rocks. Very general. Ascends to over 1000 feet on the mountains. Plentiful on banks by roadside south of Rostrevor, growing freely among the grass—an unusual position; old walls are its favourite haunt.

acutum. "In a dark cave among the Mountains of Mourne, County of Down; Sherard." Raii Synopsis (1724) (*Filix minor longifolia*, &c.). Very sparingly on basaltic cliffs on Binevenagh, Co. Derry, S. A. Stewart. On an old hedgebank near Newtownards, Co. Down, R. Ll. P.

Sherard's note would seem to be the original record of this beautiful fern from the British Isles. There appear to be two forms of this plant—an extreme form, which is the Killarney *acutum*, and with which, from the Latin description, Sherard's plant appears to be identical; and an intermediate form, to which the specimens from Binevenagh and Newtownards belong, and which is plentiful in Madeira, the Azores, and parts of Spain, which Mr. Wollaston, one of our greatest pterodological authorities, raises to the rank of a species—*Asplenium acutum*. Fronds of our Newtownards plant have been sent to several of the leading pterodologists, and the following opinions speak for themselves:—

"It is identical with the one I found all through the Pyrenees. I hardly think that it is a distinct species, though very distinct as a variety."—E. J. Lowe. "*Asplenium Acutum* (*Lowe*) of Madeira, which as a British plant, has only been found on mountains in the south-west of Ireland."—G. B. Wollaston. "The *Asplenium* I consider an acute form of *Adiantum-nigrum*."—A. M. Jones.

2. A. MARINUM. **Sea Spleenwort.**

Maritime rocks. Occurs in all suitable localities in the district.

Antrim.—Plentiful all round the coast.

Down.—Portavoe, very rare, W. H. Patterson. Abundant on the rocks at Newcastle.

Derry and Donegal.—Abundant along the coast line, wherever rocks occur.

3. A. TRICHOMANES. **Maidenhair Spleenwort.**

Walls, rocks, and dry banks. Very general; localities are unnecessary. Ascends to a considerable elevation on the mountains.

depauperatum. Knockmore, Co. Fermanagh, W. H. P.

interruptum. (*Moulei, Stansfield*). Rocks on north side of Slieve Donard, Co. Down, R. Ll. P.

multifidum. Near Sligo, and in Co. Fermanagh, W. H. P. Garron Point, Co. Antrim, R. Ll. P.

4. A. VIRIDE. **Green Spleenwort.**

Alpine rocks. Very rare.

Donegal.—Mountains near Lough Eske, E. Murphy. Gully on the north side of Slieve League, Cyb. Hib. Supplement. Lough Salt Mountains, by the waterfall above Lough Eske, and old walls near Raphoe, H. C. Hart.

Fermanagh.—Mountains near Florencecourt, T. Plunket.

Sligo.—Ben Bulben, Dr. Mackay; since found there, T. H. Corry, H. C. Hart, W. H. P.

Leitrim.—On the Glenade Mountains, W. H. P.

5. A. RUTA-MURARIA. **Wall Rue.**

Old walls, and very rarely on rocks. Very generally distributed. Luxuriantly on limestone cliffs in Co. Cavan; a few plants on basalt at Fair Head; R. Ll. P. The latter is the only case in which we have known this species to grow on anything but lime. Ascends to 1,800 feet on the Ben Bulben range, T. H. Corry.

7. SCOLOPENDRIUM.

1. S. VULGARE. **Hart's tongue.**

Woods, shady banks, and old walls. Very general. Rare about Warrenpoint and Rostrevor, R. Ll. P.

cornutum. Dundonald, Co. Down, R. Ll. P.

crenatum. Castlerock, Co. Derry, R. Ll. P.

crispum. Castleton, Co. Fermanagh, Rev. W. D. Pounden. Strabane Glen, Co. Tyrone, W. H. P. A rare and beautiful variety.

cristatum. Craigdarragh, Co. Down, Mrs. Munster, and later, R. Ll. P.

inaequale. Clandeboye, Co. Down, R. Ll. P.

involvens. Grey Point, Co. Down, R. Ll. P.

marginatum. Grey Point, Co. Down, R. Ll. P.

marginato-cornutum. Grey Point, Co. Down, R. Ll. P. A curious dwarf form, about three inches high. Leafy portion of frond almost absent.

multifidum. Colin Glen and Redhall, Co. Antrim, W. H. P. Glenarm and Woodburn, Co. Antrim; Dundonald, Co. Down; and Castlerock, Co. Derry, R. Ll. P.

muricatum. Glendevis, Co. Antrim; and Belleek, Co. Donegal, W. H. P.

peraferens. Colin Glen, Co. Antrim, W. H. P.

peraferens variegatum. Colin Glen, Co. Antrim, W. H. P.

polycuspis. Co. Fermanagh, T. Plunket. Glencraig, Co. Down, R. Ll. P.

ramosum. Castlereagh, Co. Down, and Castle Dobbs, Co. Antrim, W. H. P. Castlerock, Co. Derry, in a sea-cave, R. Ll. P.

revolvens. Castlecoole, Co. Fermanagh, W. H. P.

supralineatum. Marble Arch, Co. Fermanagh, and Knocknarea, Co. Sligo, W. H. P.

undulosum multifidum. Redhall, Co. Antrim, R. Ll. P.

variegatum Phillipsii (*T. Moore*). Colin Glen, Co. Antrim, W. H. P. One of the handsomest new varieties which our district has yielded, the fronds having a white margin.

8. CETERACH.

1. C. OFFICINARUM. **Scale Fern.**

Old walls. Very local.

Antrim.—Cave Hill, on the Deerpark wall (still there), and Galgorm near Ballymena, Templeton, 1801. Castle Dobbs, W. H. Ferguson. Muckamore, very rare, D. Redmond. Abundant on an old bridge over the Clough Water, between Clough and Broughshane, Rev. H. W. Lett. Abundant on Park Mill Bridge five miles from Glenarm, and on walls and a bridge in Glenarm Deerpark, R. Ll. P.

Down.—Old wall at Donaghadee (still there), and on a wall at Freemount north of Newry, Rev. G. Robinson. Rostrevor, Crawford. Bryansford, W. Thompson. Turner's Hill near Newry, C. Dickson. Hillsborough Park wall, Rev. C. H. Waddell. A single plant on a garden wall at Sydenham, Miss M. Patterson—possibly an escape. Near Killinchy, J. Wilson. Old wall near Newcastle, W. H. P.—since observed there, R. Ll. P. Old wall at Rademon House, R. Ll. P.

Armagh.—Goraghwood, Rev. G. Robinson. Near Bessbrook, and on the wall of Lurgan Demesne, Rev. H. W. Lett.

Donegal.—Ballyshannon, H. Allingham. Old wall at Brown Hall—very rare in Donegal—H. C. Hart. Bridge over the Lennan between Lough Fern and Ramelton, Rev. L. O'Brien. Near Bundoran, W. H. P.

Tyrone.—Cappagh, Dr. Kinahan.

Fermanagh.—Florencecourt, Hon. J. L. Cole.

Leitrim.—Glenade, S. A. Stewart.

crenatum. Abundant on Rough Fort Bridge, Co. Antrim, B.N.F.C., 1878, and often since observed. It is singular that only the crenate form occurs there. Park Mill Bridge on the Glenarm River, Co. Antrim., R. Ll. P.

9. BLECHNUM.

1. B. SPICANT. **Hard Fern.**

Woods, heaths, and mountains. Abundant.

Ascends to nearly 2000 feet.

anomalum. This curious variety, in which all the fronds are fertile half way down, occurs abundantly on the Mourne Mountains, chiefly at the Newcastle end, but we have not heard of its having been found in any other locality in the province.

anomalum inæquale. Newcastle, Co. Down, R. Ll. P.
anomalum multifidum.
anomalum trinervium.
bifidum.
caudatum.
crispatum.
cristatum.
cruciatum.
} On mountains near Newcastle, Co. Down, W. H. P.
crenatum. Drumseugh, Co. Antrim, W. H. P.
foliosum. Rostrevor, Co. Down, W. H. P.
heterophyllum. Glenarm Deerpark, Co. Antrim, R. Ll. P.
multifidum. Holywood Hills, and Dundonald, Co. Down, R. Ll. P.
ramosum. Newcastle, Co. Down, R. Ll. P.
serratum. Holywood Hills, Co. Down, R. Ll. P.
strictum. Bloody Bridge near Newcastle, Co. Down; and Strabane Glen, Co. Tyrone, W. H. P.
trinervium. This striking variety occurs abundantly at the Newcastle end of the Mourne Mountains, where it was first observed by W. H. P. in 1876, and where it forms a peculiar feature of the local flora. The fronds are shaped like a cross-handled sword, owing to the extraordinary development of the lowest pair of lobes, which sometimes measure three to four inches across.
undulosum Praeger (*Wollaston*). Craigauntlet, Co. Down, R. Ll. P.
The Mourne Mountains are very rich in varieties of *Blechnum*, as the above list shows.

10. PTERIS.

1. P. AQUILINA. **Brakes or Bracken.**
Woods, heaths, and wastes. Very common.
A comparatively lowland species, rarely ascending so high as 1,000 feet on the mountains.
multifidum. Kilmore, Co. Down, S. A. Stewart.
variegatum. Killeen near Sydenham, Co. Down, A. Robertson. Coleraine, Co. Derry, Rev. Robert Kyle. In Glenariff, Co. Antrim, and near Castlerock, Co. Derry, R. Ll. P. An extremely rare variety.

11. ADIANTUM. MAIDENHAIR.

1. A. CAPILLUS-VENERIS. **Common Maidenhair.**

Wet rocks near sea. Extremely rare.

Donegal.—In one place on the cliffs of Slieve League, Rev. L. O'Brien. Found in a second locality in this district by the B.N.F.C. in 1880, when it was thought advisable not to publish the exact spot.

Leitrim.—Glencar, J. Wynne, and later by R. Barrington and R. P. Vowell.

Reported to grow in Dunkerry Cave, Giants' Causeway, but confirmation is very necessary. Also reported from Glenariff, Co. Antrim.

12. CYSTOPTERIS. BLADDER FERN.

1. C. FRAGILIS. **Brittle Bladder Fern.**

Wet rocks and old walls. Rare.

Ascends to about 1,500 feet on the mountains.

At 1,850 feet on the Ben Bulben range, T. H. Corry.

Antrim.—Woodburn Glen, Templeton. Sallagh Braes, G. C. Hyndman, and later, B.N.F.C. Glenariff, B.N.F.C., and later, W. H. P. and R. Ll. P. Walls of Retreat Castle near Cushendall, T. H. Corry. Glenarm Deer-park, Linford River, Trostan, and on limestone at Murlough Bay, and very abundant by roadside near Retreat railway station, R. Ll. P.

Down.—Mountain above Tollymore Park, W. Thompson. Slieve Donard, Dr. Dickie. In Rademon Demesne, and on Slieve-na-glough, Shanslieve, and the mountain north of Cove M., R. Ll. P.

Armagh.—On an old bridge near Armagh, W. M'Crum.

Derry.—By the River Roe near Limavady, David Moore.

Donegal.—Alt Mountain near Ardara, Binmore, Coolcross, and Bulbein Mount, and near Pettigo, Laghy, and Moynalt, H. C. Hart.

Tyrone.—Dart Mountain, Admiral Jones.

Fermanagh.—In the baronies of Magheraboy and Clanawley, S. A. Stewart. Knockmore, W. H. P.

Monaghan.—Anketell Grove, Miss Moffett.

Cavan.—Common in the barony of Tullyhaw, S. A. Stewart.

Sligo.—Ben Bulben, Dr. Dickie; and later, W. H. P., &c.

angustata. Knockmore, Co. Fermanagh, S. A. Stewart.

dentata. Cavan and Fermanagh; frequent in the district west of Lough Erne, S. A. Stewart.

13. TRICHOMANES. BRISTLE FERN.

1. T. RADICANS. **Killarney Fern.**

Very damp shady rocks. Extremely rare.

Donegal.—In the *Journal of Botany*, vol. XXII. (1884), p. 218, the following note occurs:—*Trichomanes radicans* in Donegal—On the 25th May last, Mr. Pierce Mahony, whilst following his duties in connection with the Irish Land Commission, discovered the Killarney Fern in a valley in N.W. Donegal. Miss Grove, of Castle Grove, has also seen it in the same valley, and specimens have been sent to Dublin. I think it advisable to withhold the exact locality. This information has been given me by Mr. Ulick Bourke, Irish Land Commission.—H. C. Hart.

14. HYMENOPHYLLUM. FILMY FERN.

1. H. TUNBRIDGENSE. **Tunbridge Filmy Fern.**

Moist shady places. Very rare.

Antrim.—In Glendun, Rev. S. A. Brenan.

Down.—On Slieve Donard, Dr. Dickie.

Armagh.—In a Glen on Ferry Hill, above Narrow Water, R. Ll. P.

Donegal.—South Donegal, B.N.F.C., 1880. Slieve League, C. Dickson. Glenveigh, by the lakeside, and in the "Backwood," Carradoan, H. C. Hart.

Tyrone.—In a glen between Aughnacloy and Augher, Cyb. Hib. Supplement.

Fermanagh.—Mountain near Florencecourt, Rev. S. A. Brenan.

latifolium. In a glen on Ferry Hill, Co. Armagh, R. Ll. P. A very curious new variety, some of the fronds measuring over two inches across.

2. H. WILSONI. **One Sided Filmy Fern.**

Wet rocks. Frequent.

Antrim.—Colin Glen and Glenariff, Templeton—since observed in latter station, R. Ll. P. Rocks at the base of M'Art's Fort, Cave Hill, G. C. Hyndman, 1838, and later by others. Slievenanee, Dr. Dickie. Sallagh Braes, S. A. Stewart, and later, B.N.F.C. Glendun, Rev. S. A. Brenan. Glenarm Deerpark, W. Darragh. By Carnlough River, and on Binnagee, R. Ll. P.

Down.—Tollymore Park, Cove Lough, and north side of Diamond Mountain, Templeton, 1796; often since observed in first of these stations. In a cave on Slieve Lamagan, and on the mountain north of Cove Mountain, R. Ll. P.

Derry.—On Benbradagh and Dart Mountains, David Moore.

Donegal.—Innishowen, W. Thompson. Errigal, Nephin, and Slieve League, Dr. Dickie. Glencolumbkill, B.N.F.C., 1871. Buncrana, T. H. Corry. Erris Mountains, Glenveigh, Poisoned Glen, Carradoan, Errigal, and to the summit of Slieve Snacht West (2200 feet), Coolcross, and Gap of Mamore, H. C. Hart.

Tyrone.—Gorteen Gap, Dr. Kinahan.

Fermanagh.—Florencecourt, Hon. J. L. Cole. Knockmore and Drumbad, S. A. Stewart.

Cavan.—Cuilcagh, and Slievenakilla, S. A. Stewart.

Sligo.—Annacoona east of Ben Bulben, R. Barrington and R. P. Vowell.

ramosum. In a cave on Slieve Lamagan, Mourne Mountains, R. Ll. P. An extraordinary variety, the frond being often four or five times branched.

15. OSMUNDA.

1. O. REGALIS. **Royal Fern.**

Marshes and margins of streams. Very local.

Antrim.—Lakeshore at Shane's Castle, G. C. Hyndman—extinct there now. Near Ballinderry, Sefton. Bog at Springmount near Glarryford, J. H. Garrett—exterminated about 1855, Rev. H. W. Lett.

Down.—Donard's Cave in the Mourne Mountains, Kirkiston Bog, bog near Greyabbey, and by a lake S.W. of Castlewellan, Templeton, 1793. By the river above Newcastle, W. Thompson—here it grew abundantly till 1877, when it was completely exterminated, Rev. H. W. Lett. River at Bloody Bridge, and in a cave at the same place, C. Dickson. By the Kilbroney River near Rostrevor, Mr. Turretin. Near Killinchy, J. Wilson. Bog near Kirkcubbin, C. H. Brett. Sea-cliffs at Newcastle, R. Ll. P.

Armagh.—Bog at the south end of Lough Neagh, Templeton—this station is probably the Moyntaghs Bog, where it still flourishes, R. Ll. P.

Derry.—By the River Bann, below Portglenone, and by a lake near Kilrea, David Moore.

Donegal.—Lough Eske, and Goat Island, Lough Erne, R. Barrington. Culdaff, Gweedore, Glenties, Killybegs, and very plentiful in Glen Columbkill, Dr. Dickie. Very rare in Innishowen, H. C. Hart. Ballyshannon, H. Allingham. Shores of Lough Derg, S. A. Stewart. Arran Isles, H. C. Hart. Bundoran, W. H. P.

Tyrone.—Strabane Glen, W. H. P.

Fermanagh.—Carrick and Drumbad—abundant and luxuriant by the streams, S. A. Stewart. Carrick Lake, W. H. P.

Leitrim.—On the Glenade Mountains, W. H. P.
Sligo.—Shores of Lough Gill, R. Barrington and R. P. Vowell.
interrupta. Carrick Lake, Co. Fermanagh, W. H. P. A very distinct new variety.

16. BOTRYCHIUM. MOONWORT.

1. B. LUNARIA. **Common Moonwort.**
Dry natural pastures. Rather local.
Antrim.—Near the second lock on the Lagan Canal, Hannahstown, Knockagh, Black Mountain, and Knocklayd, Templeton. Wolfhill, G. C. Hyndman. Altmore Glen near Cushendall, W. Thompson. Above Colin Glen, S. A. Stewart. Shane's Castle, Squire's Hill, and near Randalstown, B.N.F.C. Near Kells, D. Redmond. Cave Hill, C. H. Brett and W. H. P. Carnaneigh, shore at Cushendun, and on Crosslieve near Cushendall, R. Ll. P.
Down.—Scrabo Hill, Templeton, 1806. Carngaver Hill, and on sandhills near Newcastle railway station, S. A. Stewart. Carrowreagh Hill near Craigauntlet, and Conlig Hill, R. Ll. P.
Derry.—On Benevenagh, David Moore.
Donegal—Culdaff, Dr. Dickie. Templecarn, near Pettigo, Miss Young. Gweedore, P. Mahony. Near Burnfoot, Charles Moore. Leenane, Carrablagh, west side of Rossgull, Seven Arches, Mullaghmore, and Kildrum, H. C. Hart.
Cavan.—Lough Sheelin, R. Ll. P.
Sligo.—Near the summit of Ben Bulben, S. A. Stewart.

17. OPHIOGLOSSUM. ADDER'S TONGUE.

1. O. VULGATUM. **Common Adder's Tongue.**
Moist natural pastures. Rather local.
Antrim.—By the Lagan near the second lock, Templeton, 1806. On the Knockagh, W. Thompson, and B.N.F.C. 1886. Malone, Dr. Dickie. Wolfhill, W. Millen. Colin Glen and Rathlin Island, S. A. Stewart. Shane's Castle, 1863, and Cave Hill, 1871, B.N.F.C. Bog Meadows, and Springfield, W. H. P. Plentiful in fields at Cairncastle, R. Ll. P.
Down.—Greyabbey, 1864, and Mountstewart, 1877, B.N.F.C. Near Cultra House, Robert Patterson—still there. Killinchy, J. Wilson. Crawfordsburn, Mrs. Munster.

Armagh.—Ardmore near Lurgan, and abundant in short grass on the shores of Lough Neagh, where it is under water for four winter months, Rev. H. W. Lett.

Derry.—Springhill, Garvagh, Somerset, Mountsandal, and sandhills at Magilligan, David Moore.

Donegal.—Kilderry, W. E. Hart. Ballyshannon, Carrablagh, Glinsk, Horn Head, Brown Hall, and very abundant at Leenane, H. C. Hart.

Leitrim.—Near the base of Arroo Mountain, Kinlough, R. Barrington and R. P. Vowell.

2. O. LUSITANICUM. **Dwarf Adder's Tongue.**

Dry natural pastures. Extremely rare.

Donegal.—On Horn Head and on Carrigan Head, H. C. Hart. One of our rarest local ferns, whose only known British station—if British it may be called—was Guernsey, till Mr. Hart discovered it on Horn Head in 1878. The same observer has since found it in Co. Kerry.

Holywood, Co. Down,
November 26th, 1886.

W. H. PHILLIPS.
R. LLOYD PRAEGER.

APPENDIX II.

VOL. II.

THE ESTUARINE CLAYS

AT THE NEW ALEXANDRA DOCK, BELFAST,
WITH LIST OF FOSSILS

BY R. LLOYD PRAEGER, B.E., B.A.

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On The Estuarine Clays

AT THE

NEW ALEXANDRA DOCK, BELFAST.

IN the construction of the new Alexandra Graving Dock, on the County Down side of the river Lagan, some good sections of our Post-tertiary Estuarine deposits have been exposed. Being constantly on the ground, I have had a favourable opportunity of observing the different beds over a considerable area, with the organic remains which they contain, and I propose to briefly describe the various strata pierced through in connection with this work, and some of their characteristic fossils.

The Pleistocene Clays of the Lagan Estuary have already been closely scrutinised by members of this Club, and in the very complete list compiled by Mr. S. A. Stewart, F.B.S.E.,* containing the results of his own and Mr. (now Rev. Canon) Grainger's† extensive researches, no fewer than 142 species of fossils are recorded as occurring in these beds. An examination of the deposits exposed in the excavations at the Alexandra Dock has resulted in some additions to this list, and in the present paper I shall notice such species as are noteworthy from their abundance or otherwise in particular beds, or which have not previously been recorded from our North of Ireland Estuarine Clays, and an annotated list is added of all fossils recently observed in the deposits in question.

Figure 1 represents a section measured with the spirit-level near the inner entrance of the Dock, and it may be taken as a typical section of the beds exposed. Their relative thickness varied considerably in different parts of the works, but the same sequence was noticeable throughout; and a similar general relation may be observed, not only where borings or sections have been made

* Stewart—"Fossils of the Estuarine Clays of Down and Antrim."—Proc. Belfast Naturalists' Field Club, Vol. 1., Appendix II.

† Grainger, in Natural History Review, Vol. VI., for 1859.

through the strata in the Lagan Estuary, but in the Quaternary Estuarine deposits in other parts of Ireland, and in England and Scotland. At the Alexandra Dock we have first several feet of clay and sand, which bed was still in course of formation when the works were commenced, its upper surface being a little above low water mark. Below this is a bed of yellow sand, containing many shells, which probably corresponds in age with the flint-bearing gravels of the Kinnegar at Holywood and the Curran at Larne. Immediately underlying this is that very distinct deposit, the Estuarine Clay, which at Belfast, Larne, and other points around our coasts, possesses the same peculiar features and yields the same characteristic fossils. Below this is a bed of peat, corresponding with the submerged peat which occurs in so many places on the shores of the British Isles. This rests on fine red glacial sand, the same deposit which occurs at Malone and at the Knock; which rests in turn on very fine tough red clay—re-assorted Boulder Clay. Underlying this is the Boulder Clay proper, with glacially striated pebbles, which, finally, overlies the New Red Sandstone. These last two formations were not exposed at the Dock, but there is no doubt they underlie the red clay, as they do at other points in the immediate vicinity. We have thus an unbroken series of deposits, stretching from the Boulder Clay Period to the present day, and "offering," says Mr. Stewart, "perhaps the best means of filling up the gap in geological history between the close of the Glacial Epoch and the present day."

So much for the general section. I now come to a more minute description of the deposits, and shall begin with the section which is shown in Figure 1. This is as follows:—

1. Blackish clay, with sandy layers, of a depth of six to seven feet, the surface between tide marks. Characteristic shells of this deposit are:—*Mya arenaria*, *Cardium edule*, *Tellina Balthica*, *Mytilus edulis*. *Mya* occurs in beds of thousands, the shells all in the position in which they lived, and generally with the siphonal tube preserved. *Cardium* is also very abundant. This bed yielded two specimens of *Helix nemoralis*, no doubt washed into it by surface water; and unusually large single valves of *Lucina borealis* were not unfrequent.

2. Two feet of coarse yellow sand, with abundance of shells, and also thin layers of twigs and hazel nuts. The shells are often much worn, and generally occur as single valves, and the deposit has all the appearance of an old sandy beach. *Pecten opercularis*, *Littorina litorea*, *Mytilus edulis*, occurred here abundantly, and fine specimens of *Tapes pullastra*, *T. decussatus*, and *Thracia convexa*, which two latter species are not now found living in Belfast Lough. Among the rarer forms which were noticed were:—*Fissurella Græca*, *Trochus magus*, *Patella vulgata*, *Fusus antiquus*, *Murex erinaceus*, *Cyprœa Europœa*, *Anomia patelliformis*, *Venus lincta*, *Cyprina Islandica*. Six species new to our Estuarine Clays were observed:—*Fusus gracilis*, *Anomia striata*, *Tapes virgineus*, *Venus fasciata*, *V. exoleta*, *Arca tetragona*. Several worn valves of *Scrobicularia piperata* were noticed—this shell will be referred to later on—they had probably been washed from the underlying beds.

3. Immediately below the yellow sand, the line of demarcation being remarkably sharp and well defined, is the Estuarine Clay proper. This formation, as Mr. Stewart has shown,* consists at Belfast of two beds which were laid down under widely different circumstances—an upper one, which was deposited in some thirty or forty feet of water at least, and a lower one, which is of a littoral character. The upper bed consists of very fine homogeneous blue clay, and is here about six feet thick. It is remarkably rich in shells, both large and small, many of which do not now exist in our waters, and they are for the most part in a beautiful state of preservation. *Thracia convexa, Lucinopsis undata, Cardium echinatum, Scrobicularia alba, Ostrea hippopus, Acera bullata*, are abundant, and characteristic of the deposit. Among many rare fossils obtained from this bed may be mentioned:—*Actæon tornatilis, Cyprœa Europœa, Cardium Norvegicum, Tellina tenuis.* Not hitherto recorded from the Belfast bed are:—*Aclis supranitida, Trochus umbilicatus, Rissoa striata, Melampus bidentatus, Utriculus obtusus, Cardium nodosum*; and the following are new to the deposits:—*Capulus Hungaricus, Helcion pellucidum, Cylichna cylindracea, Utriculus mammillatus, Anomia aculeata, Echinus sphœra.* Beds occur of *Ostrea* and *Pecten maximus*, both of which attain a large size; *Scrobicularia piperata* is almost unknown. Near the top of the deposit a shell layer occurred, made up almost entirely of *Scrobicularia alba* and the spines of two Echinoderms—*Amphidotus cordatus* and *Echinus miliaris.* It is to be noted that the former, which now occurs around our coasts only in sandy bays, here lived abundantly on a bottom entirely muddy.

At the base of the bed just described is a narrow zone in which the boring shells, *Pholas crispata* and *Pholas candida*, occur in profusion; this layer was also observed by Mr. Stewart on the County Antrim side of the Lagan. The shells are found in a horizontal bed, all in the position in which they lived. *P. crispata* is of very large size, twice the size which it now attains on the North of Ireland coasts—one specimen measured five inches in breadth by seven and a half in girth. The occurrence of these shells between the overlying deep-water clay and the underlying littoral deposit is of great interest, "and their appearance," says Mr. Stewart, "is the first intimation of the subsidence then commenced."

4. We now come to the lower clay, which had a depth of between six and seven feet. It is of a more sandy nature, and has a yellower colour than the upper bed, and is full of the remains of the Grass Wrack, *Zostera marina*, which furnishes further proof, if such were needed, that this is a shallow water deposit. But the contained fossils testify this conclusively. *Scrobicularia piperata* is the leading shell of this bed, occurring all through in extraordinary profusion; an essentially littoral species, which is now quite extinct on our northern coasts. Other characteristic fossils are:—*Littorina litorea, Cardium edule, Tapes decussatus.* The latter attains by no means so large a size as it does in the bed

* Stewart—"Latest fluctuations of the sea-level on our own coasts," Eighth Annual Report, Belfast Naturalists' Field Club, 1871.

of sand above. Shells are far more abundant than in the upper clay, but the number of species much more limited, and they are many of them in a fragile condition. Rare forms which were noticed here are:—*Scaphander lignarius*, *Pleurotoma septangularis*, and *Eulima bilineata*; also *Philine scabra*, *Pecten pusio*, and *Mactra solida*, var. *elliptica*, which are new to the Clays. At the base the bed becomes very sandy, and *Tellina Balthica* is abundant, along with quantities of *Cardium edule* of small size. The lowest zone consists of grey sand, and is quite unfossiliferous.

5. Immediately underlying the basal sandy layer of the lower clay is the bed of peat before-mentioned, which is now some 27 feet below high water mark, showing a corresponding subsidence of the land. Of course a far greater subsidence, followed by upheaval, has taken place; for if the upper clay was deposited in 40 feet of water, the total depression must have amounted to 50 or 60 feet, followed by 30 or 40 feet of subsequent upheaval. The peat is one to two feet thick, very much compressed, and had originally a much greater depth, as is shown by the flat ellipses into which round branches have been pressed. It is full of trunks and boughs of trees, some of which extend upward into the grey sand. Among the vegetable remains, Willow, Hazel, and Alder are easily recognisable. Hazel nuts occur, and the cones of the Scotch Fir. The broad leaves of the Iris are frequent, with remains of rushes and sedges. But the most interesting fossils which the submerged peat yielded were the bones of large quadrupeds—a tusk and two portions of the jaw of the Wild Boar, and a rib, vertebra, and leg-bone of the Red Deer. Wing-cases of insects are of not unfrequent occurrence, and in a tolerable state of preservation. In one place a layer of grey sand occurred in the middle of the peat, rapidly thinning out in all directions. A sample of this was kindly examined microscopically by Mr. Joseph Wright, F.G.S., but no organic remains were found. That the vegetation which formed this peat flourished on the spot on which it now rests, and was not drifted thither, is proved by the abundance of fine roots which descend several feet into the underlying deposit, which consists of

6. Grey sand, some two to three feet deep, very fine on the top, coarser below. In addition to the roots from the peat, of which the sand is full, the only organisms which this bed yielded were Foraminifera and Ostracoda, of which Mr. Wright, who has very kindly examined samples of all the deposits at the Dock for microscopic forms, detected seven species, namely:—*Miliolina seminulum*, *Bulimina pupoides*, *Lagena lævigata*, *Rotalia Beccarii*, *Nonionina depressula*, *Loxoconcha guttata*, *Cythere pellucida*.

7. The grey sand merges into fine red glacial sand, a deposit which is largely developed all around Belfast. It is very barren in organic remains, the only fossils detected being two Foraminifera and two Ostracoda:—*Polystomella striato-punctata*, *Rotalia Beccarii*, *Cythere pellucida*, *Loxoconcha guttata*. This sand, which contains occasional clayey layers, had a thickness of about four feet, and rested on

8. Very fine tough red clay, of glacial age, the base of which was not

reached in the deepest excavation at the Dock—the foundation of the Rudder Well, over fifty feet below high water mark—although fifteen feet of it had then been passed through. No organic remains were discovered here, but this was probably due to the small sample submitted for examination.

As regards the microscopic fossils of these beds, it may be remarked that of the 104 species of Foraminifera recorded from the Post-tertiary deposits of the North-east of Ireland, by Mr. Joseph Wright,* the Alexandra Dock sections yielded forty species, their distribution being as follows:—Estuarine Clay, 40; sandy layer overlying peat, 4; grey sand under peat, 5; red sand, 2. Of twenty species of Ostracoda, all occurred in the blue clay—one in the sandy layer above-mentioned, two in the grey sand, and two in the red sand. One species of each of these orders was found in every deposit throughout—*Rotalia Beccarii* and *Loxoconcha guttata*.

If we now turn to the section at the outer entrance of the Dock, some 600 feet north of the one just described, some striking differences will be noticed. At the west side of the entrance basin the Estuarine Clay is only four feet thick, and below it is one foot of yellowish clay, which represents the bed of peat. This rests directly upon the fine red sand, the surface of which is here twelve feet higher than at the upper end of the works. At the east side, while making excavations for the inlet culvert, an interesting section was exposed (see Figure 2). Beneath some feet of clay and sand was a bed of coarse blackish sand, with abundance of shells, at the base of which were some two or three inches of almost pure shells. In this layer *Littorina litorea* was in great abundance, along with *Cardium edule*, *Mytilus edulis*, *Lucinopsis undata*, and *Thracia convexa*—some littoral and some deep-water forms, it will be noted. This mixture of species is curious, but I think there can be little doubt that the five to twenty fathom shells which occur here in profusion were washed out of the upper clay. The faunas of the two beds (the sand and upper clay) are remarkably similar, considering the very different conditions under which they must have been laid down; but a closer examination showed me that the deep-water species in the yellow sand were almost confined to its lowest zone, which abounds in the species that especially characterise the upper division of the Estuarine Clay, which lies immediately below it. A fine valve of the rare *Cardium Norvegicum* occurred here, several examples of *Utriculus obtusus*, and a single specimen of *U. mammillatus*, which is new to the Clays. Immediately below the shell layer is the Estuarine Clay, which at this point is only two feet thick. The deposit is very sandy, except at its upper surface, and is replete with species which have lived and died in what was then the sandy bottom of a bay several fathoms deep. Full-sized examples of the large *Lutraria elliptica* are of constant occurrence, along with large specimens of *Mya truncata*, and *Thracia convexa*, *Solen vagina*, and *Tapes pullastra*; of these *Mya* and *Tapes* are the only species now found living in the waters of our Lough. A rare and

*Wright—"Post-tertiary Foraminifera of the North-east of Ireland."—Proc. Belfast Naturalists' Field Club, Vol. I., Appendix V.

interesting specimen which I found here consisted of a large valve of *Cyprina Islandica*, to the interior face of which a full-sized Oyster was adhering, its shell fashioned to the shape of the *Cyprina*, and the other valve was lying close at hand. This tells of a slow rate of accumulation of the deposit. The *Cyprina* lived and died, and the valves of its shell in time broke asunder. Then the Oyster came and settled in the untenanted house of its predecessor, and it grew and flourished before the slow rain of fine mud buried both in a quiet grave. *Pholas crispata* and *P. candida* occur frequently; and a single specimen of *Pholas dactylus*, new to our Estuarine Clays, was observed. At the base of the bed, where it is quite sandy, there is abundance of *Cardium edule*—this stratum evidently corresponds with the lower clay of the first section. Below this we come directly upon the red sand; there is no trace of the peat bed. The sand is nearly twenty feet in thickness, and rests on the red clay.

It is interesting to compare the sections above described with other sections in the Lagan Estuary which have been examined by local geologists. The beds exposed when Spencer Basin was in course of construction, on the opposite side of the river, which were so thoroughly examined by Mr. Stewart, consisted simply of some twenty feet of Estuarine Clay, which he divides into three well-defined zones:—

1. Surface clays; abounding in littoral species.

2. Zone of *Thracia convexa*; characterised by shells which live in five to ten fathoms of water.

3. *Scrobicularia* zone; in which littoral species again predominate.

The physical and palæontological differences between the two latter were more marked than at Alexandra Dock; the beds of peat and sand were not exposed.

Borings at King Street, in the centre of the town, under the superintendence of Mr. Wm. Swanston, F.G.S., showed a depth of no less than twenty-eight feet of Estuarine Clay, at the base of which was a layer containing many twigs and hazel nuts. Next came twenty-four feet of fine running sand, which yielded on examination four species of Foraminifera, two of these being the two forms obtained in the red sand at the Dock. Beneath this was fifty feet of very fine red Boulder Clay, in which two Foraminifera were found to occur very sparingly, namely:—*Rotalia Beccarii*, and *Polystomella striato-punctata*, the same species which formed the only fossils of the red sand in the Dock sections. The fine clay rested on Boulder Clay, as it usually occurs in our neighbourhood, 100 feet in thickness, and abounding in Foraminifera, underlying which were the sandstones of the New Red.

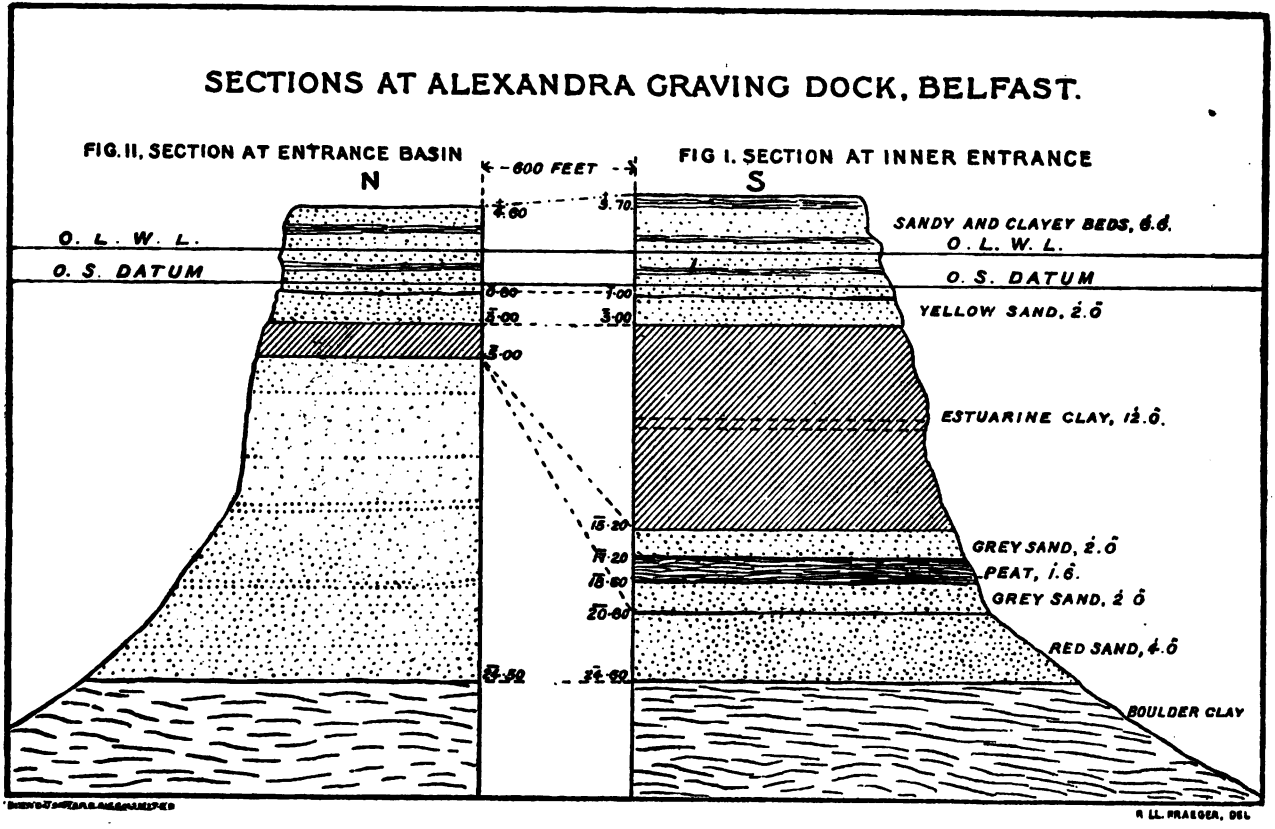
At Sydenham Railway Station a different state of things may be noticed. We have only a couple of feet of Estuarine Clay, replete with the shells of species which live between tide-marks, its upper surface being about three feet above high-water mark, or sixteen feet higher than the top of the Estuarine Clay at the Dock. Then comes a foot of yellow sand, at the base of which is a narrow zone crowded with the crumbling remains of littoral species. This

rests, at different points, on fine red sand, gravel, or fine red clay; but before we have reached low-water level, we come upon the coarse Boulder Clay with pebbles, which at this place is therefore some ninety feet higher than in the Lagan Valley a mile to the westward, as shown by the King Street borings.

This concludes my brief notice of the Post-pliocene deposits of the Lagan Estuary. The Belfast beds have now been pretty well examined, and our knowledge of them is tolerably complete; but there is still an ample field for research in the similar clays which are to be found in almost all our loughs and bays; and it is to be hoped that other members of our Club will devote some of their time and attention to these interesting deposits—the latest page of the great mysterious volume of geological history. The clay at Magheramorne is famous for the profusion of Foraminifera, some of them of great rarity, which it yields,* and its richness in large fossils is apparent from the fact that during one visit—my only visit to it—no less than seventy-one species of fossils were noted, Microzoa excluded. Further examination of this deposit will without doubt result in considerable additions to this number.

* See Wright—"Post-tertiary Forams., N.E. Ireland," Proceedings Belfast Naturalists' Field Club, Vol. I., Appendix II.

SECTIONS AT ALEXANDRA GRAVING DOCK, BELFAST.



In the following list of 186 species and varieties found at Alexandra Dock, I have employed the term "top clays" to designate the clayey and sandy beds which formed the highest and most recent deposit. "Upper clay" signifies the upper or deep-water zone of the Estuarine Clay, "Lower clay" the underlying littoral deposit. On account, perhaps, of its less interesting and less varied fauna, the lower clay was not so thoroughly examined as the zone above, and it is probable that some of the species recorded here as from the upper clay alone, occurred also in the lower bed.

I have to acknowledge much kind assistance rendered by Mr. S. A. Stewart, F.B.S.E., in the identification of critical species; by Mr. Joseph Wright, F.G.S., who catalogued the Microzoa of the deposits; and by Professor Cunningham, M.D., of Queen's College, who identified the vertebrate remains.

LIST OF FOSSILS

OBSERVED IN THE ESTUARINE CLAYS AT THE ALEXANDRA DOCK, BELFAST.

NOTE.—The nomenclature of the Mollusca is that adopted by J. Gwyn Jeffreys in his Manual of British Conchology. The Foraminifera are named according to H. B. Brady's Report on the Foraminifera of the "Challenger" Expedition; the Ostracoda in accordance with Dr. G. S. Brady's Report on the "Challenger" Ostracoda.

Species marked (*) are additions to the Estuarine Clay fauna of the North of Ireland; those marked (†) are new to the Belfast deposit.

* **Cervus elaphus,** *Linn.*

A dorsal vertebra, right radius, and posterior right rib of the Red Deer occurred at different spots on the upper surface of the peat bed.

* **Sus scrofa,** *Linn.*

Two portions of the lower jaw of a large Wild Boar, with teeth and both tusks, and at another place a single tusk, were found in a position similar to the Red Deer remains.

Helix nemoralis, *Müll.*
Two specimens of this land shell occurred in the top clays.

Patella vulgata, *Linn.*
Yellow sand, very rare, and much worn. (One specimen, *Grainger*).

* **Kelcion pellucidum,** *Linn.*
Several young specimens in the upper clay.

Rissurella Græca, *Linn.*
Very rare; a single specimen in the yellow sand.

* **Capulus Hungaricus,** *Linn.*
Upper clay, one specimen.

Trochus magus, *Linn.*
In the yellow sand and upper clay, very rare.

Trochus cinerareus, *Linn.*
Very frequent, except in the lower clay, where it did not occur.

† **Trochus umbilicatus,** *Mont.*
Upper clay, rare, and of small size.

Lacuna divaricata, *Fabr.*
Very frequent, especially in the upper clay.

Littorina obtusata, *Linn.*
Frequent throughout.

Littorina obtusata, *var.* **æstuarii,** *Jeff.*
Two examples in the upper clay.

Littorina rudis, *Maton.*
Frequent in the upper and lower clays. (Scarce, *Stewart*).

Littorina rudis, *var.* **tenebrosa,** *Mont.*
Upper clay, one specimen.

Littorina litorea, *Linn.*
Common throughout the deposits.

Rissoa inconspicua, *Ald.*
Common, and generally distributed. Now quite extinct in our lough.

Rissoa membranacea, *Adams.*
With the last species.

Rissoa violacea, *Desm.*
Very frequent in the upper and lower clay.

† **Rissoa striata,** *Adams.*
In the upper clay, not uncommon.

Rissoa vitrea, *Mont.*
With the last, but rare.

Hydrobia ulvæ, *Penn.*
Occurs throughout the deposits; in abundance in the most recently formed bed.

Turritella terebra, *Linn.*
Frequent; attains a large size in the upper clay.

Scalaria Turtonæ, *Turt.*
Of constant occurrence in the upper clay. Not now living in Belfast Lough.

† **Aclis supranitida,** *S. Wood.*
In the upper clay, rare.

Odostomia lactea, *Linn.*
This elegant little shell is not uncommon in the upper clay and yellow sand.

Eulima bilineata, *Ald.*
A single specimen in the lower clay. (One specimen, *Grainger*).

Natica catena, *Da Costa.*
One small example in the lower clay.

Natica Alderi, *Forbes.*
Upper clay, very frequent.

Aporrhais pes-pelecani, *Linn.*
Upper and lower clay, and yellow sand, abundant, especially in the first.

Cerithium reticulatum, *Da Costa.*
In the greatest profusion throughout.

Purpura lapillus, *Linn.*
In different beds, but very uncommon.

Buccinum undatum, *Linn.*
Plentiful in all but the top clays.

Murex erinaceus, *Linn.*
Very uncommon in the deposits, but of large size.

Fusus antiquus, *Linn.*
A few specimens, of large size, occurred.

* **Fusus gracilis,** *Da Costa.*
In the yellow sand, extremely rare.

Nassa reticulata, *Linn.*
A common shell in the upper clay and yellow sand.

Nassa pygmæa, *Lamk.*
Very abundant in the upper clay, but does not occur in either the lower clay or top clay. See Mr. Stewart's note in his list of Estuarine Clay Fossils.

Pleurotoma brachystoma, *Phil.*
Two specimens in the upper clay.

Pleurotoma septangularis, *Mont.*
I found one specimen in the lower clay.

Cyprœa Europœa, *Mont.*

Our little cowry is extremely rare. The upper clay yielded one specimen, and the yellow sand another.

* **Cylichna cylindracea,** *Penn.*

In the upper clay, very rare.

* **Utriculus mammillatus,** *Phil.*

A fragment of a shell of this tiny species in the yellow sand made me look for more, and I discovered a perfect specimen in the upper clay.

† **Utriculus obtusus,** *Mont.*

In the upper clay and yellow sand, but few and far between.

Utriculus hyalinus, *Turt.*

One specimen was discovered inside the closed valves of a *Tapes*, in the lower clay. (Plentiful in the Belfast bed, *Stewart*).

Acera bullata, *Müll.*

In profusion in the upper clay, but so fragile that it is well nigh impossible to obtain a perfect specimen.

Actæon tornatilis, *Linn.*

One dilapidated specimen in the upper clay.

Scaphander lignarius, *Linn.*

Lower clay, very rare.

Philine aperta, *Linn.*

Very frequent in the upper clay and yellow sand.

* **Philine scabra,** *Müll.*

In the lower clay, very rare.

† **Melampus bidentatus,** *Mont.*

Upper clay, very scarce.

Anomia ephippium, *Linn.*

Quite abundant in the upper and lower clay and yellow sand, n every variety of shape and size. I obtained one beautiful specimen adhering to the flat valve of a large *Pecten maximus*, with ridges on both valves as high and regular as those on the *Pectea*, and measuring four inches in diameter.

* **Anomia aculeata,** *Müll.*

Two or three specimens occurred in the yellow sand.

Anomia patelliformis, *Linn.*

Very rare. One specimen was obtained in the yellow sand. (Rare, *Grainger*).

* **Anomia patelliformis,** *var.* **striata,** *F. & H.*

Yellow sand, a single valve.

Ostrea edulis, *Linn.*

The Oyster is abundant throughout the deposits. Fine examples occur in numbers in the upper clay, the colours in the interior as vivid as if the animal had inhabited the shell but yesterday.

Ostrea edulis, *var.* **hippopus,** *Lamk.*
In the upper clay, frequent, and of immense size. One specimen weighed over a pound and three quarters.

Pecten varius, *Linn.*
Single valves not uncommon, perfect specimens rare.

Pecten opercularis, *Linn.*
Fine examples are scattered plentifully through the upper clay; in the yellow sand single valves are abundant.

Pecten maximus, *Linn.*
In the upper clay, here and there, regular layers of the large shells of this species and of the *Ostrea* were observed.

* **Pecten pusio,** *Linn.*
One valve of this deformed-looking species was found in the lower clay. A rare shell in our present waters, and not hitherto observed in the Estuarine Clays.

Mytilus edulis, *Linn.*
The Mussel is plentiful in the top clays and yellow sand, reaching in the latter its full limit of size. In the upper clay it is unknown, but appears again in the lower clay in a crumbling condition.

* **Mytilus edulis,** *var.* **pellucidus,** *Penn.*
Examples of this perhaps not distinct variety are frequent.

Mytilus modiolus, *Linn.*
Not at all common. I obtained one perfect specimen and a few fragments in the upper clay.

Mytilus Adriaticus, *Lamk.*
Rare; a few young shells in the upper clay.

Nucula nucleus, *Linn.*
Diffused through the upper clay.

* **Area tetragona,** *Poli.*
One complete specimen in the bed of yellow sand.

Montacuta bidentata, *Mont.*
This tiny bivalve is scattered plentifully through the upper clay and yellow sand.

Montacuta ferruginosa, *Mont.*
In the upper clay, very rare.

Lucina borealis, *Linn.*
In the uppermost deposit at the Dock large specimens of this shell occurred, but only as single valves.

Axinus flexuosus, *Mont.*
Generally diffused, and abundant.

Cardium echinatum, *Linn.*

In the deep-water clay fine specimens of this beautiful species are abundant. Worn single valves are common in the overlying yellow sand.

Cardium exiguum, *Gmel.*

Diffused through the deposits, but scarce, and usually as single valves.

† **Cardium nodosum,** *Turt.*

The upper clay yielded one small valve of this species, so rare as an Estuarine Clay fossil.

Cardium edule, *Linn.*

In the top clays and yellow sand abundant and large, not uncommon in the upper clay, and in the lower clay very abundant, but of small size.

Cardium edule, *var.* **rusticum,** *Chemn.*

Some very oblique valves probably belong to this variety.

Cardium Norvegicum, *Speng.*

This fine shell is very rare. A single valve was discovered in the upper clay, and another in the blackish sand of the outer entrance section. (One valve, *Grainger*. Two or three valves, *Stewart*).

Cyprina Islandica, *Linn.*

Beyond the complete specimen mentioned in my paper (p. 34), the only evidence of the occurrence of this large shell was the fragments of one great valve, which had been some five inches in breadth, which I found in the yellow sand. (One perfect specimen, *Stewart*).

Venus lincta, *Pult.*

Rare; a few single valves scattered through the top clays and yellow sand.

* **Venus exoleta,** *Linn.*

Very rare; three single valves occurred in the yellow sand.

Venus Gallina, *Linn.*

Distributed through the upper and lower clays, but of small size.

* **Venus fasciata,** *Da Costa.*

A single valve in the yellow sand.

Tapes aureus, *Gmel.*

Frequent, and scattered throughout.

Tapes aureus, *var.* **ovata,** *Jeff.*

Very rare. (Not uncommon, *Stewart*).

Tapes pullastra, *Mont.*

In the upper clay and yellow sand, where it attains an unusual size. (Frequent, especially in the lower zone, *Stewart*).

Tapes decussatus, *Linn.*

In the yellow sand very large valves are frequent. In the upper clay it is uncommon, but large; and in the lower clay it occurs in profusion, but small.

* **Tapes virgineus,** *Linn.*
Very rare, I found two worn valves in the yellow sand.

Lucinopsis undata, *Penn.*
In great abundance, and very large, in the upper clay, of which it is one of the most characteristic fossils. Large single valves occur in numbers in the shelly layer at the base of the yellow sand, lying on the upper surface of the clay.

Tellina Balthica, *Linn.*
In profusion, but of small size, in the top clays. Abundant and large in the lower clay, particularly in the basal portion.

Tellina tenuis, *Da Costa.*
Very rare. A few specimens in the newest deposit.

Psammobia Ferroënsis, *Chemn.*
Single valves occasionally observed.

* **Mactra solida,** *var.* **elliptica,** *Brown.*
One valve in the lower clay.

Mactra subtruncata, *Da Costa.*
Very frequent, but small and of variable form, in the deposits.

Lutraria elliptica, *Lamk.*
Over the greater portion of the excavations young specimens only occurred, but, as previously mentioned, near the outer entrance, where the clay thinned out to a depth of only a couple of feet, full-grown specimens were abundant, covered with a rich golden-brown epidermis, and measuring up to six inches in breadth.

Scrobicularia alba, *Wood.*
In extraordinary profusion in the upper clay. Much rarer in both the underlying clay and the yellow sand.

Scrobicularia piperata, *Bellonius.*
In countless thousands in the lower clay. Almost entirely absent from the other beds.

Solen pellucidus, *Penn.*
Frequent in the deep-water deposit.

Solen vagina, *Linn.*
In the upper clay and yellow sand, not uncommon. It is very strange how this species has disappeared from our bay, and how *S. siliqua*, which is unknown in the Estuarine Clays, has taken its place.

Solen ensis, *Linn.*
With the last, but rarer.

Thracia papyracea, *Poli.*
Upper clay only, not rare.

Thracia convexa, *W. Wood.*
Very characteristic of the upper clay, in which it is found in abundance. Common also with *Lucinopsis* in the shell layer which rests on the upper clay. Quite absent from the lower and top clays.

Corbula gibba, *Olivi.*
Common in the upper clay, frequent in the lower bed.

Mya arenaria, *Linn.*
Top clays only, where it is in great abundance.

Mya truncata, *Linn.*
Plentiful throughout the upper clay, and very large. Single valves in the yellow sand.

Pholas candida. *Linn.*
With the two following species, this boring shell occurred only in the Pholad zone, between the upper and lower clay, where it was abundant.

Pholas crispata, *Linn.*
Perfect specimens, of most unusual dimensions (see p. 31), were observed all over the area of excavation, but only in the zone above-mentioned.

* **Pholas dactylus,** *Linn.*
A single complete specimen in the Pholad layer.

Teredo Norvegica, *Speng.*
Fragments of the calcareous tubes of this species were found in the upper clay.

* **Echinus sphæra,** *Müll.*
Spines of this large Echinoderm in the upper clay.

Echinus miliaris, *Leske.*
This "urchin" is rather common in the clays, but is of small size. Mr. Stewart mentions a thickly-packed layer of the shells of this species near the surface of the upper clay at Spencer Basin.*

Amphidotus cordatus, *Penn.*
The fragile shells of this "heart-urchin" are rather common in the upper clay, and its spines occur in profusion.

* **Cancer pagurus,** *Leach.*
Fragments of a large claw in the yellow sand.

* **Carcinus mœnas,** *Leach.*
I twice got remains of this crab in the upper clay.

* **Portunus depurator,** *Leach.*
Top clays, rare.

Serpula triquetra, *Linn.*
Very frequent on shells all through.

* See Footnote, page 29.

Serpula vermicularis, *Linn.*
Not uncommon in the deposits.

Cornuspira involvens, *Reuss.*
Frequent in the Estuarine Clay.*

† **Biloculina ringens,** *Lamk.*
Estuarine Clay, rare.

† **Biloculina depressa,** *d'Orb.*
Estuarine Clay, very rare.

Miliolina oblonga, *Montagu.*
In the blue clay, rare.

Miliolina seminulum, *Linn.*
Frequent in the blue clay; also occurred, but sparingly, in the grey sands, both above and below the peat bed. (In great abundance, *Stewart*. Rare, *Wright*).

† **Miliolina secans,** *d'Orb.*
In the blue clay, rare.

Miliolina subrotunda, *Montagu.*
Blue clay, rather frequent. (Very rare, *Wright*).

* **Miliolina sclerotica,** *Karrer.*
Blue Clay, frequent.

Trochammina squamata, *J. & P.*
Very rare in the Estuarine Clay.

Trochammina macrescens, *Brady.*
Estuarine Clay, very scarce.

Trochammina inflata, *Montagu.*
Estuarine Clay, frequent.

Bulimina pupoides, *d'Orb.*
Common in the Estuarine Clay, rare in the basal sandy portion.

Bulimina ovata, *d'Orb.*
Frequent in the blue clay.

Bulimina elegantissima, *d'Orb.*
Abundantly distributed through the blue clays.

Bulimina marginata, *d'Orb.*
With the last, and equally abundant.

Virgulina Schreibersiana, *Czjzek.*
Blue clay, frequent.

† **Bolivina punctata,** *d'Orb.*
Generally diffused through the blue clay.

* I regret that in the case of the Foraminifera and Ostracoda I did not take care to obtain samples of both the upper and lower clays, and have them examined separately. Samples of the clays were closely scrutinized, but the fossils of both the littoral and deep water beds were grouped together under the head of "Estuarine Clay," or "Blue Clay."

Bolivina plicata, *d'Orb.*
Very frequent in the blue clay. (Rare, *Wright*).

* **Bolivina difformis,** *Will.*
In the blue clay, rare.

Lagena lævis, *Montagu.*
Estuarine Clay, frequent.

* **Lagena lævis,** *var.* **clavata,** *d'Orb.*
Estuarine Clay, frequent.

Lagena striata, *d'Orb.*
Frequent throughout the blue clay.

† **Lagena gracilis,** *Will.*
One or two specimens only, in the blue clay.

Lagena semistriata, *Will.*
Rather more frequent than the last.

† **Lagena hexagona,** *Will.*
Blue clay, very scarce.

* **Lagena lævigata,** *Reuss.*
A few examples in the grey sand under the peat.

* **Lagena lævigata,** *var.* **lucida,** *Will.*
Frequent in the Estuarine Clay.

* **Lagena Orbignyana,** *Seg.*
Blue clay, very scarce.

† **Nodosaria communis,** *d'Orb.*
A single specimen in the blue clay.

† **Nodosaria scalaris,** *Batsch.*
Very sparingly distributed.

† **Cristellaria rotulata,** *Lamk.*
Blue clay, very rare.

Polymorphina lactea, *W. & J.*
A few examples in the Estuarine Clay.

† **Uvigerina angulosa,** *Will.*
Not at all common.

† **Globigerina inflata,** *d'Orb.*
Very rare, one specimen only.

Discorbina globularis, *d'Orb.*
Not uncommon in the blue clay. (Very rare, *Wright*).

† **Planorbulina Mediterranensis,** *d'Orb.*
Blue clay, frequent.

Truncatulina lobatula, *W. & J.*
Blue clay, scarce.

Rotalia Beccarii, *Linn.*
Abundant in the blue clay, and in the greatest profusion in the basal sandy layer. In the grey sand below the peat it was of frequent occurrence, and in the red glacial sand a few much-worn specimens were observed.

† **Rotalia nitida,** *Will.*
In the Estuarine Clay, very rare.

Nonionina depressula, *W. & J.*
Common in the blue clay. In the grey sand overlying the peat it was very scarce, but in the grey sand under the peat it again occurred abundantly.

Polystomella crispa, *Linn.*
Of frequent occurrence.

Polystomella striato-punctata, *F. & M.*
In the Estuarine Clay abundantly; also in the red sand, where it was extremely rare.

Pontocypris mytiloides, *Norman.*
Blue clay, rare.

Cythere pellucida, *Baird.*
Abundant in the blue clay and in the sandy layer at its base; very rare in the red sand. Abundant in the lough at the present time.*

Cythere crispata, *Brady.*
Plentiful in the blue clay; very rare in our present waters.

Cythere viridis, *Müller.*
In the blue clay, very scarce. (Throughout the deposits, *Brady, Crosskey, and Robertson*). †

Cythere lutea, *Müller.*
Blue clay, not common.

Cythere convexa, *Baird.*
Blue clay, very rare.

Cythere villosa, *G. O. Sars.*
Very rare. (Throughout the clays, *Brady, Crosskey, and Robertson*).

Cythere concinna, *Jones.*
Common in the Estuarine Clays.

Cythere tuberculata, *G. O. Sars.*
Like the last, common.

Cythere Dunelmensis, *Norman.*
In the Estuarine Clay, not unfrequent. Extremely rare in our present waters.

* For the present distribution of Ostracoda in our waters, see Malcomson, "Recent Ostracoda of Belfast Lough."—Proc. Belfast Naturalists' Field Club, Vol. II., Appendix IX.

† Brady, Crosskey, and Robertson—Monograph of the Post-tertiary Entomostraca of Scotland, p. 102.

Cythere antiquata, *Baird.*
Frequent in the blue clay.

Cythere Jonesii, *Baird.*
Diffused through the blue clay.

Cythere Whiteii, *Baird.*
Blue clay, rare. Not now found in the lough.

* **Loxoconcha guttata,** *Norman.*
Plentiful in the Estuarine Clay. It also occurred sparingly in the sand both above and below the peat bed, and in the red sand was very rare.

Loxoconcha impressa, *Baird.*
Not uncommon in the blue clay.

Cytherura nigrescens, *Baird.*
In the blue clay, abundant.

Cytherura striata, *G. O. Sars.*
Not at all common.

Cytherura undata, *G. O. Sars.*
Very scarce in the clays.

Paradoxostoma ensiforme, *Brady.*
Blue clay, frequent.

* **Paradoxostoma Fischeri,** *G. O Sars.*
Rare in the Estuarine Clay. Very rare in our present waters.

Pinus sylvestris, *Linn.*
Cones and branches of the Scotch Fir occurred in the submerged peat.

Quercus Robur, *Linn.*
A few boughs in the peat.

Alnus glutinosa, *Gaert.*
Occasional seed vessels in the peat.

Salix alba, *Linn.*
Boughs and stumps, which, I believe, belonged to this species, were abundant in the peat.

Corylus Avellana, *Linn.*
Hazel nuts were of frequent occurrence in the peat, and were quite plentiful in certain thin layers in the top clay.

Iris pseud-acorus, *Linn.*
Leaves and fruit in the peat.

Zostera marina, *Linn.*
The Grass-wrack is very abundant in the lower clay.

Pteris aquilina, *Linn.*
Rhizomes of the Bracken were not uncommon in the peat bed.

In order to render this a complete catalogue of the Fossils of the Belfast Clays, I append a list of all species which have been recorded from these beds by other observers, which did not occur at the Alexandra Dock. These, added to the preceding, bring up the total number of fossils found in the Belfast deposits to 235 species and varieties.

Helix rotundata, *Linn.*
One specimen, *Grainger.*

Zonites nitidulus, *Drap.*
Two specimens, *Grainger.*

Tectura virginea, *Müll.*
Very rare (one young specimen), *Stewart.*

Lacuna crassior, *Mont.*
Was distributed in some numbers, *Grainger.*

Lacuna pallidula, *Da Costa.*
Scarce, *Stewart.*

Odostomia pallida, *Mont.*
Was met with sparingly, *Grainger.*

Odostomia acuta, *Jeff.*
Rare, *Stewart.*

Odostomia indistincta, *Mont.*
Rare, *Stewart.*

Odostomia interstincta, *Mont.*
Very rare, *Stewart.*

Defrancia gracilis, *Mont.*
Very rare, one specimen only, *Stewart.*

Pleurotoma costata, *Donovan.*
One specimen, *fide Grainger.*

Pleurotoma rufa, *Mont.*
"As a post-glacial or quaternary fossil I have identified *P. rufa* from only the Belfast deposit."—*J. G. Jeffreys.*

Pleurotoma turricula, *Mont.*
Rare, *Stewart.*

Cylichna nitidula, *Lov.*
One shell, *Stewart.*

Lima hians, *Gmel.*
Very rare, *Stewart.*

Mytilus Adriaticus, *var.* **ovalis,** *Sowerby.*
"Occurred in excavating a channel in Belfast Harbour."—*J.G. Jeffreys*

Modiolaria marmorata, *Forbes.*
Very rare, *Stewart.*

Leda minuta, *Mull.*
A single valve, *Grainger.*

Cyamium minutum, *Fabr.*
Rare, *Stewart.*

Tellina squalida, *Pult.*
Thompson—Belf. Mus. Coll.

Psammobia vespertina, *Chemn.*
A single valve, *Grainger.*

Mactra truncata, *Mont.*
Scarce, *Stewart.*

Lutraria oblonga, *Chemn.*
One large specimen, *fide Grainger.*

Solecurtis antiquatus, *Pult.*
A single specimen, *fide Grainger.*

Thracia pubescens, *Pult.*
One specimen, *Grainger.*

Panopea plicata, *Mont.*
Plentiful in one narrow zone, *Stewart.*

Saxicava rugosa, *Linn.*
Rare, *Stewart.*

Saxicava rugosa, *var.* **arctica,** *F. & H.*
Rare, *Grainger.*

Gastrochæna dubia, *Penn.*
Very rare, *Grainger.*

Creusia verruca, *Leach.*
Two or three specimens, *Grainger.*

Pectinaria Belgica, *Pall.*
One specimen, *Grainger.*

Terebella conchilega, *Pall.*
Grainger.

Miliolina trigonula, *Lamk.*
Common, *Stewart.* Rare, *Wright.*

Spiroloculina limbata, *d'Orb.*
Rare, *Stewart.*

Spiroloculina planulata, *Lamk.*
Very rare, *Stewart.*

Textularia sagittula, *Defrance.*
Rare, *Wright.*

Textularia variabilis, *Will.*
Common, *Wright.*

Verneuilina polystropha, *Reuss.*
Very rare, *Stewart.*

Lagena gracillima, *Seguenza.*
Rare, *Wright.*

Cythere albomaculata, *Baird.*
Rare, *Stewart.*

Cythere pulchella, *Brady.*
Near the surface of the clays, *Brady, Crosskey, and Robertson.**

Cytheridea elongata, *Brady.*
Surface of clays, *B., C., and R.*

Loxoconcha tamarindus, *Jones.*
In the oldest and newest zones of the clays, *B., C., and R.*

Xestoleberis depressa, *G. O. Sars.*
B., C., and R.

Xestoleberis aurantia, *Baird.*
B., C., and R.

Cytherura similis, *G. O. Sars.*
Lowest zone of the clays, *B., C., and R.*

Cytherura affinis, *G. O. Sars.*
B., C., and R.

Cytherura gibba, *Müller.*
Lowest zone, *B., C., and R.*

Cytherura acuticostata, *G. O. Sars.*
Uppermost zone of the clays, *B., C., and R.*

Paradoxostoma variabile, *Baird.*
B. C. and R.

* Monog. Post-tert. Entom., Scotland, p. 102.

APPENDIX III.

VOL II.

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THE MARINE SHELLS

OF

THE NORTH OF IRELAND.

BY R. LLOYD PRAEGER, B.E., B.A.

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The Marine Shells of the North of Ireland.

——(:-:)——

INTRODUCTION.

IN compiling the following list of the recent Marine Shells of the North of Ireland, the object of the writer has been to bring together, and present in simple and accessible form, the information which we possess regarding this attractive branch of local zoology. The literature bearing on the subject consists of a number of papers and notes scattered through various publications, some of them not easily obtainable by the enquirer, while the matter which they contain is generally in such a form that it is not easy to discover immediately what shells have been found in our district, and in what localities. Such, too, is the difference of nomenclature in the works referred to, that it is a task of some difficulty to compare and correlate the lists of *Mollusca* which they contain ; and in Thompson's works, indeed, which were published before the value of systematic nomenclature was appreciated as it is now, it is occasionally very troublesome to find what species is intended. In the list which follows, the names adopted by J. Gwyn Jeffreys in his "British Conchology"—the standard work on the subject— are employed, and where a species is referred to by any of the authors quoted under a different name, such synonym is appended in parenthesis.

The sources of information which have been utilised in preparing the present paper are as follows:—

I. "A History of British Mollusca," by Messrs. Forbes and Hanley. This work supplies a few North of Ireland stations for species, other than those taken from Thompson's work, to be mentioned immediately.

II. "The Natural History of Ireland," by William Thompson: vol. IV., 1856. In this work 350 species and varieties of Marine Shells are recorded as Irish, under the names which were in use prior to the publication of Forbes and Hanley's treatise, of which some 240 are noted from localities in Ulster; the majority of these notes are given *verbatim* in the following pages. Mr. Thompson's earlier list of Irish Shells, which appears in his "Report on the Fauna of Ireland: Division Invertebrata," in the British Association Report for 1843, contains many species not to be found in the "Natural History of Ireland"; but it may be safely assumed that such were intentionally excluded from the latter work, for many Shells had been recorded as native on very insufficient grounds; and the writer has, therefore, thought it best to be guided by the "Natural History" alone, as it contains all the notes which Mr. Thompson considered thoroughly reliable.

III. The "Reports of the Belfast Dredging Committee," by George C. Hyndman, in the Reports of the British Association for 1857, '58, and '59. The following is a summary of the lists which these Reports contain:—

	Station.	Depth in Fathoms.	Species.
1857 Report.	1. Belfast Bay and Neighbourhood ...	0-100	205
	2. Turbot Bank	25-30	192
	3. Off Maiden Rocks	70-100	42
1858 Report.	1. 2 Miles off Ballygalley Head ...	15-25	52
	2. Cod Bank, 3m. N. of Muck I. ...	20	73
	3. Larne Lough, 1-2½m. from entrance....	4-5	26
	4. Brown's Bay, Island Magee ...	1-4	21
	5. S. of Maiden Rocks	20	45
	6. E. and S.E. of Maiden Rocks ...	70-90	95
	7. Turbot Bank	25-30	129
	8. Turbot Bank	25-30	18
	9. 2 Miles S.S.E. of Black Head ...	25	118
	10. "The Riggs" Bank, S.E. of Donaghadee	20	63
	11. 4 Miles S.S.E. of Black Head ...	15	79
	12. The Sound, Copeland Islands ...	12	40

1859 Report. An annotated list of additional species and additional localities, and a few corrections.

The Stations above are conveniently arranged in four groups, viz:—

1. Belfast Lough. This signifies the waters lying west of a line drawn from Orlock Point, in Co. Down, to Black Head, in Co. Antrim, and not exceeding 10 fathoms in depth.

2. Entrance of Belfast Lough. Under this head come a number of dredgings made around the entrance of the Bay, from Donaghadee on the Co. Down shore, northward as far as the great cliff-range of The Gobbins, in Island Magee, Co. Antrim. By far the most important of these, as far as results are concerned, are those made on the Turbot Bank, "a great submarine bank lying a short distance out from the cliffs called The Gobbins, and extending from the Isle of Muck across the entrance of Belfast Bay towards the Copeland Islands."* On this bank, which lies in from 25 to 30 fathoms of water, a number of rare and interesting species have been obtained, but almost all in a dead state, and it is to be noted that some of the Turbot Bank shells are very doubtfully recent, while a few are certainly fossil. Mr. Hyndman expresses the opinion that the majority of the shells are derived from the deep recess lying near the Maiden Rocks, a few miles to the northward, which will presently be mentioned; but it would appear probable that some submarine pleistocene deposit in the neighbourhood has also contributed to the rich store of *Testacea* which the Turbot Bank yields.†

3. Larne Lough. Mr. Hyndman's party made but one haul of the dredge in this lough; it yielded so little that apparently the scientists never revisited waters that gave so poor a return for their labours. This poverty in shells is the more remarkable when we take into consideration the extreme richness in *Mollusca* of the Estuarine Clays in that vicinity.

4. Off Larne. This term embraces a large number of stations, from Isle of Muck northward to Ballygalley Head, and out eastward to beyond the Maiden Rocks. The latter consist of a group of rocky islets lying some six miles from shore; on their seaward side the water deepens rapidly, and over a limited area a depth of 90 and 100 fathoms is reached. This abyss, which is very difficult to dredge on account of the rocky nature of the bottom and the strong currents that sweep over it, is the home of many rare species, and those who have successfully faced

* Hyndman, 1857 Report.

† The question of the origin of the Turbot Bank shells is one of much interest, and has not been satisfactorily settled. The opinion of the compilers of the Naturalists' Field Club "Guide to Belfast and the adjacent Counties," is worth recording:—"About 200 species of *Mollusca* have been enumerated from the Turbot Bank, many of them being of extreme rarity; but the majority occurring as dead shells only. It has been suggested that this bank is only a submarine fossil bed, and that a great portion of the shells are really relics of the glacial epoch. It is, however, quite as likely that they are accumulated on this bar by currents, and that they belong to species still living in the vicinity, on rocky bottoms where the dredge has little chance of picking them up."

the troubles attending dredging on such ground, at such a depth, have been rewarded with living examples of *Argiope cistellula*, *A. capsula*, *Propilidium ancycloides*, and other deep-sea treasures.

IV. "Report on the Marine Zoology of Strangford Lough, Co. Down, and corresponding part of the Irish Channel," by George Dickie, M.D., Professor of Natural History, Queen's College, Belfast, in the British Association Report for 1857. A summary of the lists here presented is as follows:—

Station.	Depth in Fathoms.	Species and Varieties.
1. Castle Ward Bay	20	102
2. Wellstream Bay	15	28
3. Upper part, ditto	4-8	43
4. Bay opposite Killyleagh	6	13
5. Centre of Lough	15-25	38
6. Gun Island, Irish Channel	7	8

Then follow lists of the *Testacea* of the open channel opposite the entrance of the Lough, divided into zones according to the distance from shore.

V. "British Conchology," by J. Gwyn Jeffreys, F.R.S., &c., 1863-9. This work contains, besides repetitions of many of Thompson's, Dickie's, and Hyndman's records, some notes of species obtained by the author, and also by Mr. Waller and Mr. Adair, on the North of Ireland coasts; those notes will be found under the respective species.

There are earlier works which contain references to North of Ireland *Mollusca*, but all reliable records of any importance are to be found repeated in the books cited above. During the long period that has elapsed since the publication of even the latest of these, though a good deal of dredging has been done by local scientists, very little has been added to the knowledge of our Marine Shells, attention having been chiefly concentrated on the interesting *Microzoa* which the earlier Naturalists had left almost untouched. Indeed, the only additional matter of which I have been able to avail myself is a few manuscript notes by Mr. S. A. Stewart, F.B.S.E., and the same by the present writer, while an examination of the shells contained in the cabinets of Mr. William Swanston, F.G.S., of Belfast, and Miss Richardson, of Portrush (to both of whom my best thanks are due), and of those in the local collection in the Belfast Museum, has yielded some additional stations for species.

Where practicable, I have preferred giving *verbatim* quotations from the authors quoted, in place of a general summary of their remarks.

Of the 404 British species contained in that portion of the Sub-Kingdom *Mollusca*, as described by Jeffreys, to which the present paper refers (*i.e.* the classes *Brachiopoda*, *Conchifera*, *Solenoconchia*, and *Gasteropoda* to the end of *Pleurobranchiata*), our district has yielded 291, or very nearly $\frac{3}{4}$—119 bivalves and 172 univalves—exclusive of such species as are importations or fossils, and which are printed inside brackets. On the whole, the Fauna has a northern aspect, since, of these 291 species, 36 are boreal forms, which live either not at all, or very sparingly, south of Britain, while only 12 are essentially southern, having been taken seldom or never north of the British coasts; the remaining 243 inhabit seas both north and south of our islands. As is to be expected from geographical considerations, the southern species frequent chiefly the western shores of the province, while the northern forms have been mostly taken on the eastern coast. Of the northern types, *Crenella decussata*, *Leda minuta*, *Tectura testudinalis*, *Emarginula crassa*, *Trichotropis borealis*, and *Trophon truncatus*, will serve as examples—they have all been taken alive in our waters; while the following will serve as representatives of the southern forms which the district yields—*Modiolaria costulata*, *Crenella rhombea*, *Arca lactea*, *Trochus Duminyi*, *Natica sordida*, *Ovula patula*.

Only one species is, as a British shell, confined to our province—*Trochus Duminyi*; it occurs on the western coast, and is a southern shell, its foreign stations being all Mediterranean.

The *Testacea* of the counties of Antrim and Down may be considered as pretty well worked up, though the North of Antrim offers a good field that has been scarcely touched. County Londonderry contains extensive sandy beaches, which yield a large variety of species, that of Magilligan especially; here the observations have been chiefly made from shore, and dredgings in the deeper water might yield interesting results. I find no record whatever of any dredging in Lough Foyle. From the extensive coast-line of County Donegal, with its magnificent headlands and deep inlets and sandy bays, comes hardly a single note to enrich the list which follows. At Bundoran, indeed, in the extreme southwestern corner of the county, Mrs. Hancock made many finds, which she communicated to Thompson; and here Mr. Waller discovered a new British *Trochus*, *T. Duminyi*, whose only British station is still Bundoran; but beyond these, the conchology of the most northern county of Ireland still remains to be investigated, and will probably amply repay the investigator.

Mr. Thompson appears to have placed but light value on the *condition* (living or dead) of the shells which he found in his dredgings, or thrown up by the tide, and in many instances does not mention this point at all. In the present paper the writer perhaps has erred in the opposite extreme, and has placed undue importance on this point, but it does appear to him to be of interest and importance to know whether or not a shell has been taken living in the district. It is to be remembered, however, that the fact of a species not having been found living, is by no means positive proof that it no longer

inhabits a region. Many bivalves burrow deeply in sand and mud, and flourish out of reach of the naturalist's dredge. When they die, the shells come up to the surface, and are thus thrown on shore by the waves, or taken by the dredge, in a fresh state.

In conclusion, the writer expresses a hope that the following list may prove a reliable foundation for a more complete and extended paper on the Marine *Mollusca* of the North of Ireland, and that by showing the incompleteness of the record, it may encourage other workers to give some of their attention to this interesting subject.

ANNOTATED LIST OF SPECIES.

CLASS BRACHIOPODA.

The *Brachiopoda* are well represented in the district, as out of the six British representatives of the class, four live in our waters.

Terebratula caput-serpentis, *Linné.*

Not uncommon in the deeper water at the entrance to Belfast Lough, and off Larne, from the Copeland Islands to the Maiden Rocks, living in from 12 to 100 fathoms of water—Thompson (*T. aurita*), Hyndman, and others. Dickie obtained it alive at the entrance to Strangford Lough in 12-15 fathoms.

Argiope cistellula, *Searles Wood.*

"Living on stones as well as shells in the deeper water"—Hyndman, 1859 Report. Labels in the Belfast Museum Collection show that the Turbot Bank is the place intended.

Argiope capsula, *Jeffreys.*

Hyndman records this rare species (*sub Terebratula capsula*) as found living with the preceding, and Jeffreys, referring to the same station, says "Larne, Co. Antrim (Hyndman and J. G. J.)" The latter author also gives "off Portrush (Waller)."

Crania anomala, *Müller.*

Off Larne, and at the entrances to Belfast and Strangford Loughs, living in 12-90 fathoms—Thompson (*C. personata*), Hyndman, and Dickie.

CLASS CONCHIFERA.

ORDER LAMELLIBRANCHIATA.

Anomia ephippium, *Linné.*

Abundantly distributed throughout our waters, living in from 4 fathoms in Strangford Lough to 90 fathoms near the Maiden Rocks, attached to stones and shells. Different forms of this very variable species are recorded under the names *A. squamula*, *A. cylindrica*, and *A. aculeata*.

Anomia patelliformis, *Linné.*

General, living in 12-90 fathoms. Thompson has it under *A. undulata;* he mentions a fine specimen which was obtained adhering to the inside of a quart bottle found in the stomach of a cod-fish!

var. **striata.** Frequent, living in from 12 to 25 fathoms; Hyndman dredged dead shells in up to 100 fathoms (*A. striata.*)

Ostrea edulis, *Linné.*

Gregarious, and widely distributed, from low-water mark to 25 fathoms. Thompson mentions Carrickfergus oysters which he examined, which weighed, before being opened, over 2lbs., the animal by itself weighing 1½oz. Hyndman states, on the authority of a Groomsport fisherman, that oysters "of large size and good quality" have been brought up on the long lines from 45 fathoms; this depth is the limit assigned by Jeffreys to the species.

Pecten pusio, *Linné.*

Living in Belfast, Strangford, and Carlingford Loughs, and in the deeper waters of the Channel, in up to 90 fathoms, its other limit of depth being 10 fathoms. Thompson notes it *sub P. sinuosus.* Dead valves frequent on the Derry coast—R.Ll.P.

Pecten varius, *Linné.*

10-25 fathoms, attached to old bivalve shells, &c., like the last species. Of general occurrence around the coasts of Donegal, Derry, Antrim, and Down.

Pecten opercularis, *Linné.*

A common species, and almost universally distributed, living on sand in from 7 to 25 fathoms.

var. **lineata.** "Var. *lineatus* I have dredged in Belfast Bay"—Thompson. I have it also from this locality—R.Ll.P.

Pecten septemradiatus, *Müller.*

Recorded with doubt (*sub P. Danicus*) by Hyndman in his 1857 Report as from the Turbot Bank, determined by Dr. Dickie. In 1859 Report he records the finding of a second valve, in 80 fathoms, thus confirming Dr. Dickie's determination.

Pecten tigrinus, *Müller.*

Thompson mentions this shell, under the names *P. lævis* and *P. obseletus,* both of Pennant, as having been found in Belfast and Strangford Loughs. Hyndman dredged it frequently, living in 20-90 fathoms, and Dickie records it from Strangford Lough as living in 12-20 fathoms. Single valves at Portrush—Miss Richardson; and Magilligan—R.Ll.P.

Pecten Testæ, *Bivona.*

The following note on this rare species occurs in Hyndman's 1859 Report (*sub P. furtivus*):—"Taken alive in 1858 by Mr. Waller and Mr. Hyndman on both the Antrim and Down coasts, along with *P. striatus.* It was taken again this year, and at once distinguished by Mr. Jeffreys."

Pecten striatus, *Müller.*

"A single specimen dredged in Strangford Lough in 1837 by Mr. Hyndman and myself"—Thompson. Hyndman obtained it twice alive off Donaghadee, in 12 and 20 fathoms respectively, and also in 70-90 fathoms off the Maidens, and dead on the Turbot Bank. Dickie dredged dead valves in Strangford Lough.

Pecten similis, *Laskey.*

No note of its having been taken alive, but dead valves have been dredged frequently at the mouth of Belfast Lough, in 15-35 fathoms, and Dickie records the same from the entrance of Strangford Lough, 12-15 fathoms.

Pecten maximus, *Linné.*

Common here as elsewhere, living in 7-25 fathoms. "Along the Antrim and Down coasts, where it is commonly called *clam*, and used as human food, though not so generally esteemed as the scallop (*P. operularis*)"—Thompson.

Lima subauriculata, *Montagu.*

Dead valves only, in from 4 to 90 fathoms on various parts of the Antrim and Down shores, by the Ordnance Survey collectors, Thompson, Hyndman, and Dickie.

Lima Loscombii, *G. B. Sowerby.*

"Dredged very sparingly, alive, in the deeper portions of Belfast and Strangford Loughs, on sandy and shelly ground. Single valves of large size obtained in quantity from 23 fathoms at the entrance to the former by Mr. Hyndman. Obtained occasionally in the stomach of haddock taken on the North-East coast"—Thompson, whose *L. fragilis* also belongs to this species. Hyndman procured it frequently, both living and dead, in 15-90 fathoms; Dickie took it alive outside Strangford Lough, in 12-15 fathoms.

Lima hians, *Gmelin.*

"The Ordnance Museum contains upon a card a fresh-looking specimen of this shell, as dredged from 7 fathoms in Belfast Bay"—Thompson (*sub L. tenera*). Hyndman's only note of it is a repetition of this record. From a note in Jeffreys' work, Waller would appear to have taken it somewhere on the North-East coast, and the Belfast Museum Collection contains a specimen of Thompson's labelled "Belfast Lough."

It is very doubtful if this species can be now reckoned among our indigenous mollusks; but it lived in abundance in our waters at no very distant date, for the Estuarine Clay at Magheramorne, on Larne Lough, yields it in the greatest profusion, and it has been found in the similar deposit at Belfast.

Pinna rudis, *Linné.*

This fine species, our largest British shell, inhabits the waters off Black Head (25-30 fathoms), where it has been obtained by Hyndman (*P. pectinata*) and others. Thompson mentions (*sub P. ingens*) a wider distribution; he says of it, "the very few specimens, all taken in deep water, which I have seen from the coasts of Londonderry, Antrim, Down, and Louth, were of large

size, and all *P. ingens* or *P. fragilis* (Turt. Brit. Biv.)," and he gives Portrush, Belfast Bay, and 50 fathoms off Island Magee, as localities where examples have been procured. It has been found at the first-mentioned station by Miss Richardson also. Probably the earliest record of this shell in our district is that in a letter from the Rev. Robert Innes, Rector of Magilligan, to Dr. Nicholson, Bishop of Derry, dated June 2nd, 1725, in which he describes a large example found in that neighbourhood. General Portlock, of the Geological Survey, writing in 1843*, and commenting on the above, says "this coast continues a good locality for *Pinna fragilis*; to obtain the fish in the valves they must be dredged up from deep water."

Mytilus edulis, *Linné.*

Common on all our shores. Thompson gives some interesting notes as to the rapid growth and increase of this prolific species; for instance, that on a buoy in Belfast Lough, cleaned after being 5 years down, "the entire circumference of the base, for a foot of space always under water, was covered a foot thick with full-grown mussels"; and that the bottom of the pilot-boat after its being 9 months afloat, yielded quantities of mussels 1½ inches long.

var. **incurvata.** "The only bivalve seen on Tory Island, where it is abundant, covering the rocks"—Thompson.

var. **pellucida.** "Common in some parts of Belfast Bay"—Thompson (*sub M. pellucidus*). Cultra, S. A. Stewart—Belf. Mus. Coll.

Mytilus modiolus, *Linné.*

The "horse-mussel" is common, living in gravelly and muddy localities in 6-90 fathoms. Dickie found it very abundant in Strangford Lough (4-25 fathoms), coming up in quantity in almost every haul of the dredge (*sub Modiola modiolus*).

var. **ovata.** "County Antrim (J.G.J.)"—Jeffreys.

Mytilus Adriaticus, *Lamarck.*

Rare in the province. Thompson mentions it (*sub Mediola tulipa*) from Belfast Lough; and Hyndman, under the same name, as living sparingly in 10 to 20 fathoms, while he obtained dead valves on the Turbot Bank, and in 75 fathoms near the Maidens. Strangford Lough—Belf. Mus. Coll. I have found complete and fresh-looking specimens on the shores of Belfast and Carlingford Loughs.

Mytilus phaseolinus, *Philippi.*

Living in 15-20 fathoms off Belfast Lough, and in 70-90 fathoms off Larne —Hyndman (*sub Modiola phaseolina*); and in 4-20 fathoms in Strangford Lough—Dickie.

Modiolaria marmorata, *Forbes.*

Found in numbers, embedded in the skin of *Ascidia mentula* and other *Tunicata*, all round the coast, in depths up to 90 fathoms. Hyndman places it under genus *Crenella*, and Thompson and Dickie under *Modiola*.

* Report on the Geology of the County of Londonderry &c., p. 23.

Modiolaria costulata, *Risso.*

Found at Bundoran, Co. Donegal, by Mr. Waller—Jeffreys.

Modiolaria discors, *Linné.*

"Larne Lough, not uncommon. Donaghadee, 8 to 10 fathoms, Dr. Drummond"—Thompson (*sub Modiola discrepans*). "Living, rare, at the roots of *Antennularia* and other Zoophytes, in from 10 to 25 fathoms"—Hyndman, who also obtained it, dead, on the Turbot Bank (*sub Crenella discors*). Crawfordsburn, Mr. S. A. Stewart—Belf. Mus. Coll.

Crenella rhombea, *Berkeley.*

"Bundoran (Waller)"—Jeffreys (Supplement).

Crenella decussata, *Montagu.*

Living in gravelly sand, in 15 to 30 fathoms, off Donaghadee, Black Head, and Larne, and it was one of the few species which Hyndman obtained alive in Larne Lough (4-5 fathoms). Thompson's only Irish note of the species states that Mr. Hyndman dredged a few odd valves in Strangford Lough; Dickie took it alive in 18-20 fathoms at the entrance of the latter.

Nucula nucleus, *Linné.*

Abundant, living in 5-90 fathoms, in sand and gravel, throughout the North of Ireland.

var. **radiata,** though stated by Thompson (*sub N. margaritacea*) to be common around the coast, has apparently a more limited distribution in our waters.

Nucula nitida, *G. B. Sowerby.*

Living in mud and sand in from 12 to 20 fathoms, off Donaghadee and Black Head—Hyndman; and frequent in 4-25 fathoms in Strangford Lough —Dickie. Hyndman also records it, with doubt, from 1-4 fathoms, Brown's Bay, Island Magee. Dead shells occur on the Turbot Bank.

Nucula tenuis, *Montagu.*

Hyndman records having dredged this species alive in deep water near the Maidens, and specimens labelled as from that locality are in the Belfast Museum.

Leda pygmæa, *Münster.*

"On the Antrim Coast"—Jeffreys (all said of it). Belfast Lough—Belf. Mus. Coll. It is rare as a British species, inhabiting chiefly the Scandinavian and arctic seas.

Leda minuta, *Müller.*

Portrush; 23 fathoms in Belfast Bay; and 50 fathoms off South Rock, Co. Down; all by Mr. Hyndman—Thompson (*sub Nucula minuta*). In his subsequent systematic exploration, Hyndman obtained it occasionally, living in mud, gravel, and sand, in from 12 to 90 fathoms, and more frequently dead, in 1-90 fathoms (*sub L. caudata*). Dickie took it alive in Strangford Lough.

Pentunculus glycymeris, *Linné.*

Living in sand and gravel in 10-90 fathoms all round our coast; and more

abundant in a dead state. Hyndman notes that it was dredged by his party in great quantity in 10 to 12 fathoms at Ballygalley, on the Antrim coast, all dead, but valves united and quite fresh, and that their death was due, in Dr. Dickie's opinion, to deposits from peat-bogs carried down by rivulets. Thrown up in abundance at Magilligan strand, but only single valves. Shells of unusual size ($2\frac{3}{4} \times 2\frac{3}{4}$ inches) may be found at Orlock Point, Co. Down; they have a rather ancient appearance, and are probably washed in from the Turbot Bank. Thompson cites this species *sub P. pilosus*.

Arca lactea, *Linné.*

Hyndman dredged dead specimens of this shell on the Turbot Bank (25-30 fathoms) on three occasions.

Arca tetragona, *Poli.*

"Portrush *in situ*—Ordnance Collectors. Magilligan, odd valves—W.T." —Thompson. Hyndman obtained it dead on the Turbot Bank several times, and records a single living specimen which he dredged in 50 fathoms, embedded in a pebble of black limestone, off the Copeland Islands. Single valves frequent on the Derry coast—R.Ll.P.

[**Arca barbata,** *Linné.*

" 'This very perfect and new shell on our coasts was found alive, adhering to an oyster from Killinchy in Strangford Lough, by Dr. M'Gee of Belfast,' Brown. Never found since"—Thompson. It is a common Mediterranean species, which is not admitted as native by any of our conchologists. There must have been some mistake.]

Lepton nitidum, *Turton.*

Dredged alive by Waller on the Turbot Bank, and dead in the same vicinity by Waller and Hyndman—Hyndman, 1858 Report.

Montacuta substriata, *Montagu.*

This little shell, whose peculiar habitat is the ventral spines of *Spatangus purpureus* and other Echinoids, is noted by Thompson and Hyndman as living at the entrance of Belfast Lough, in 20 to 30 fathoms, and by Dickie off Strangford Lough, in 12 to 15 fathoms.

Montacuta bidentata, *Montagu.*

"Bangor, Belfast Bay (one specimen), 1834, Mr. Hyndman and W.T. Bundoran, Mr. Warren"—Thompson. Hyndman, and Mr. Wm. Swanston dredged it dead on the Turbot Bank. Cushendall—Belf. Mus. Coll. These appear to be the only records of a species whose decline as a member of the marine fauna must have been rapid, as our pleistocene clays yield it in great profusion.

Montacuta ferruginosa, *Montagu.*

Turbot Bank, dead—Hyndman. The *M. ovata* mentioned by Thompson is probably this species; he states that several examples of it were found on the beach at Bundoran by Mrs. Hancock.

Lassea rubra, *Montagu.*

Common between tide marks—Hyndman. Portrush, and Belfast Bay—Thompson. (Both *sub Kellia rubra*). Magilligan—Belf. Mus. Coll.

Kellia suborbicularis, *Montagu.*

Bundoran—Thompson. Dead, rare, in 10 fathoms in Belfast Bay, and on the Turbot Bank—Hyndman. In Strangford Lough, and in the Irish Channel adjoining, Dickie found it living in 7 to 25 fathoms. Magilligan—Belf. Mus. Coll.

Loripes lacteus, *Linné.*

Recorded from the Turbot Bank, dead, by Hyndman, 1857 Report (*sub Lucina leucoma*). This record is not confirmed by Jeffreys, and as the species was not obtained again, and is entirely a southern form, it is doubtful if it should be included in our fauna.

Lucina spinifera, *Montagu.*

"At Red Bay, County Antrim, I found a valve of this species"—Thompson. Hyndman dredged it once alive "on a bank called 'The Riggs,' lying south of the Copelands, about a mile south of Donaghadee, and a mile from shore, in about 20 fathoms," and several times dead, off Belfast Lough, in 15-30 fathoms.

Lucina borealis, *Linné.*

Commonly dredged in a dead state, in Belfast and Larne Loughs and the deeper waters adjacent, in all depths from 1 to 30 fathoms. Thompson mentions it (*sub L. radula*) as found at Red Bay, and in 6 to 12 fathoms in Belfast and Strangford Loughs, by himself and Mr. Hyndman, but as the latter naturalist, in his subsequent report on the *Mollusca* of Belfast Bay (1857), notes it only in the column of dead shells, it may be assumed that such alone were found in the locality named. In Strangford Lough Dickie took it frequently alive, in depths ranging from 7 to 25 fathoms. Single valves are commonly thrown ashore on the Derry coast, where also the writer has found living specimens.

Axinus flexuosus, *Montagu.*

"Widely distributed, but in sparing numbers"—Thompson. I find no note of its having been taken alive. Hyndman dredged dead specimens occasionally in 5-30 fathoms, and Dickie, in Strangford Lough, 4-25 fathoms. Thompson gives Strangford Lough and Bundoran as localities. (Mentioned by the authors quoted *sub Lucina flexuosa*).

Cyamium minutum, *Fabricius.*

Abundant, among sea-weeds and stones near low-water mark. Thompson states (*sub Montacuta purpurea*) that the shoals of mullet (*Mugil chelo*) consume vast quantities of them when roving over the *Zostera* banks in spring and summer, and Hyndman (*sub Turtonia minuta*) estimates that in the stomach of a mullet taken in Larne Lough, there were 35,000 of these little shells.

Cardium echinatum, *Linné.*

In the reports of Hyndman and Dickie, the only note of this fine shell having been taken alive is by the former, who obtained a few living examples in Larne Lough, 4 to 5 fathoms; while in a dead state it occurred in all the localities dredged, in 4 to 30 fathoms. Thompson says "dredged from oozy sand in Belfast and Strangford Loughs" by Hyndman and himself, but does not state whether living or dead. Dredged alive in 6 fathoms off Bangor—Mr. S. A. Stewart. After northerly gales it is thrown ashore in some numbers on the Co. Down shore of the lough, from Holywood to Craigavad, with the animal quite fresh. Single valves of large size are abundant, and complete specimens frequent, on the sandy beaches of Magilligan and Portrush.

Cardium exiguum, *Gmelin.*

Living in oozy ground in Larne Lough, and in the deeper waters adjoining, in 4 to 90 fathoms; the limit assigned by Jeffreys is 15 fathoms, so the greater depth quoted would appear to be quite unusual. In and around Belfast Lough it has not been taken alive, and is rare in a dead state. It lives sparingly in Strangford Lough—Dickie, and R.Ll.P. Thompson gives Red Bay as an additional station. (*Sub C. pygmæum* by Hyndman and Dickie). Portrush, dead—Miss Richardson.

Cardium fasciatum, *Montagu.*

Frequent, living on gravel and sand in 15 to 20 fathoms. Dead in Strangford Lough, on the Turbot Bank, and in up to 90 fathoms of water off Larne. In Thompson's work it appears as *sub C. elongatum* and *C. edule* var. *fasciatum.*

Cardium nodosum, *Turton.*

Belfast and Strangford Loughs—Thompson. Dredged living in 12 fathoms in the Sound between the Copeland Islands, and dead on the Turbot Bank, by Hyndman. More abundant in Strangford Lough and the channel adjoining than elsewhere; Dickie dredged it frequently there, living in 7-20 fathoms.

Cardium edule, *Linné.*

Gregarious everywhere in sandy bays, at and near low-water mark. Dead shells are dredged on the Turbot Bank, and Hyndman obtained a living example in 20 fathoms between the Maidens and the Isle of Muck. "Attains a very large size in Donegal Bay"—Thompson.

Cardium minimum, *Philippi.*

Thompson made a new species, *C. Loveni*, out of specimens of this shell dredged by Mr. Hyndman from 50 fathoms off the South Rock, Co. Down, and although they subsequently proved to be identical with a species already described and named, to him belongs the credit of having added this pretty shell to the British fauna. Hyndman subsequently records it (*sub C. Suecicum*) from the Turbot Bank, and from shallower water (4-5 fathoms) in Larne Lough—in both instances dead.

Cardium Norvegicum, *Spengler.*

"Dredged off Glenarm, in Belfast and Strangford Loughs, sparingly"—

Thompson (*sub C. lævigatum*); it is not stated that any of the specimens obtained were alive. Hyndman took it alive only once, which was in 15 fathoms, on a bottom of mud and shells, 4 miles S.S.E. of Black Head, and Mr. Swanston has dredged living examples, of small size, at the entrance of the lough. Dead, it is abundant at various depths in many localities; large single valves are frequently thrown up on the Co. Down shore of Belfast Lough.

Isocardia cor, *Linné.*

This large and handsome shell is extremely rare in the North of Ireland, and the authority for its admission to our marine fauna rests almost entirely with Thompson, whose notes of its occurrence I may give in full:—"The following note appears in Mr. Templeton's MS. journal, under October 28th, 1811: 'Received a drawing of the *Chama cor*, from Mr. George Joy, taken by him from a specimen dredged up at Bangor (Belfast Bay).' The species is known to Mr. J. R. Clealand to have been dredged near the Copeland Islands, at the entrance of this bay. The Giant's Causeway is named by Turton as a locality in which it has been found; but very rarely. Glassdrummond, Co. Down, P. Doran." The only other record of its occurrence which I have come across is in Dr. Dickie's report, who notes it "very rare, dead," upper part of Wellstream Bay, Strangford Lough, 4-8 fathoms. Jeffreys gives east and south of Ireland alone.

Cyprina Islandica, *Linné.*

Living throughout our waters, in sand and mud, in 1-25 fathoms. Thrown up in great numbers on Magilligan strand during northerly gales. From Thompson's notes it would appear to be much more abundant on the eastern than on the western shores of Ireland. Mr. W. H. Patterson, M.R.I.A., contributes two curious local names for this species: the one is "yaghan" or "neayghen," the other "griggan."

Astarte sulcata, *Da Costa.*

"Dredged off the Co. Antrim coast; in Belfast and Strangford Loughs sparingly, from about 8 to 25 fathoms, on mud and sand"—Thompson (*sub A. Danmoniensis*). Living in from 10 to 27 fathoms, at the entrance to Belfast Lough, and more abundantly off Larne, in 15-90 fathoms—Hyndman; and in 7-25 fathoms in Strangford Lough—Dickie.

var. **Scotica.** Antrim coast; Belfast and Strangford Loughs—Thompson (*sub A. Scotica*). Living in 10-20 fathoms off Belfast Lough, and in 70-90 fathoms near the Maidens, and dead on the Turbot Bank—Hyndman. I have specimens dredged near Ardmillan, in Strangford Lough.

var. **elliptica.** Belfast Lough—Belf. Mus. Coll.

Astarte compressa, *Montagu.*

Hyndman's 1859 Report contains a note of a few valves of this species having been found in Turbot Bank sand by Mr. Jeffreys; but Jeffreys, in his "British Conchology," says, evidently referring to the same specimens,

"subfossil in 25 fathoms off Larne, Co. Antrim." As will appear subsequently, this is by no means the only northern species which has been dredged, if not fossil, at least very doubtfully recent, in that locality.

Astarte triangularis, *Montagu.*

Belfast and Strangford Loughs, dredged by Mr. Hyndman—Thompson (*sub Goodalia triangularis*). Living on the Turbot Bank—Hyndman; and in Strangford Lough and the channel adjacent—Dickie; depth 7 to 30 fathoms, sandy ground. Dead valves are abundant on the Turbot Bank.

Circe minima, *Montagu.*

Thompson's only northern locality is Belfast Bay, on the authority of Mr. Hyndman (*Cyprina minima*). Hyndman obtained it alive twice, in 20 fathoms, gravelly bottom, his stations being the Cod Bank north of the Isle of Muck, and "The Riggs" bank south of the Copeland Islands, while in a dead state it occurred frequently in depths ranging from 15 to 100 fathoms. Dickie procured living examples off the mouth of Strangford Lough, 12-15 fathoms, and dead valves further out to sea.

Venus exoleta, *Linné.*

Belfast, Strangford, and Larne Loughs—Thompson, who does not state if the shell was alive in any instance. Though noted by Hyndman and Dickie from almost every station (1-30 fathoms), in no case was it taken in a live state. Hyndman remarks (1857 Report) that at Cultra single valves are thrown up by the tide, and says, "probably still living." At the place in question, fresh-looking specimens with the valves attached are frequent, and I have twice picked up living examples there, and have no doubt that it lives in some quantity in the vicinity. This and the following species are placed under the genus *Artemis* by the authors quoted.

Venus lincta, *Pulteney.*

Rare in a live state, the Cod Bank north of Isle of Muck (20 fathoms), Wellstream Bay in Strangford Lough (15 fathoms), and 12-15 fathoms in the open channel near the entrance of the latter, being the only stations I can find. More common dead, thrown up on sandy beaches, from Magilligan in Co. Derry to Newcastle in Co. Down.

Venus fasciata, *Da Costa.*

This beautiful species is of frequent occurrence throughout the district, living on gravelly and sandy ground; it has been dredged alive off Larne and Belfast Lough, and in Strangford Lough and the open sea adjoining, in depths varying from 7 to 30 fathoms, by Thompson, Hyndman, Dickie, and others.

Venus Casina, *Linné.*

Another handsome species, which inhabits our waters, ranging from 7 fathoms in Strangford Lough to 70 fathoms off the Maiden Light-houses, on gravel, sand, and mud. Dead valves are plentiful on the Turbot Bank and at various depths (6 to 90 fathoms), on the Antrim coast.

[**Venus verrucosa,** *Linné.*

"Mr. Hyndman's cabinet contains a young shell (*V. cancellata*) given him as from Magilligan"—Thompson; much too slender evidence on which to establish a claim for its admission to our fauna. Its distribution in Ireland is confined to the south and west.]

Venus ovata, *Pennant.*

The dredgings of Hyndman and Dickie show that this pretty little shell is one of the most generally distributed of all our bivalve molluska, as it occurred in almost every haul, generally alive, in from 4 to 90 fathoms. In Strangford Lough it lives in great abundance, and it is one of the very few species which Hyndman found living in Larne Lough. "A rather common species"—Thompson (*Cytherea ovata*).

Venus gallina, *Linné.*

A common species. "Found alive from low-water mark to 8 and 10 fathoms on the North and North-East sandy coasts. Thrown ashore on the sandy beach of Magilligan in quantity and of large size"—Thompson. The *V. Pennantii* mentioned by this author belongs to the present species. Hyndman and Dickie found that it lives in from 0 to 25 fathoms in all the waters explored (*sub V. striatula*). The *V. striolata* in Dickie's paper is apparently a misprint for *V. striatula*.

Tapes aureus, *Gmelin.*

Quoting from an older authority, Thompson says of this species "'Carrickfergus Bay (Dr. M'Donnell) rare,' Brown," and under Turton's name of *Venus ænea*, gives Strangford Lough as a locality where he has taken it alive. Hyndman states (1857 Report) that it is common, living on sandy beaches between tide-marks, but it does not appear to be by any means of such frequent occurrence as would appear from this remark. Dickie dredged dead valves in Strangford Lough, and Hyndman on the Turbot Bank. Mr. Swanston informs me that it is abundant in Lough Swilly, in Co. Donegal, and Miss Richardson has sent me complete and fresh specimens from Portrush.

Tapes virgineus, *Linné.*

This handsome shell is of very common occurrence, in sandy and nullipore ground, in 4 to 90 fathoms all round our shores.

var. **Sarniensis.** "Var. *V. Sarniensis*, Turt. Brit. Biv., is taken in Belfast Bay"—Thompson (*sub Pullastra virginea*). "Donaghadee, in 8 fathoms (Patterson)"—Forbes and Hanley. "Living, rare, off Bangor"—Hyndman.

var. **elongata.** "Larne, Co. Antrim (Hyndman)"—Jeffreys. Belfast Lough—Belf. Mus. Coll.

Tapes pullastra, *Montagu.*

Abundant, living between tide-marks. "A common species on sandy beaches"—Thompson (*sub Pullastra vulgaris*). Dickie records it living in the unusual depth of 7-20 fathoms in Castle Ward Bay, Strangford Lough. Some valves from Belfast Lough are of unusual size—2½ inches broad.

Jeffreys says the breadth of his largest specimen, found in Skye by Edward Forbes, is 2¼ inches, and that 1·7 is the average breadth.

var. **perforans.** Inhabits the forsaken burrows of *Pholades*, and chinks of rocks. Common—Thompson (*sub Pullastra perforans*).

var. **oblonga.** "Bundoran, Co. Donegal (J.G.J.)"—Jeffreys.

Tapes decussatus, *Linné.*

There is no certain record of this generally common species having been taken alive in our province. Thompson, referring to the whole of Ireland, says (*sub Pullastra decussata*) "a common species", and in his "Report on the Fauna of Ireland" (1843), he has a cross opposite its name in the "North of Ireland" column, but he mentions no northerly locality. Jeffreys simply says "shores of Ireland". Hyndman's only note is to the effect that it occurs in the alluvial deposits, and is not now known to be living in Belfast Lough; neither he nor Dickie found even dead valves in their dredgings. Miss Richardson has found a specimen with the valves united, at Portrush, but the shell looks old and worn. I have taken it alive at Carlingford, and it is abundant on the coast of Co. Louth, but appears to stop short on the borders of Ulster.

Lucinopsis undata, *Pennant.*

Dead valves occasionally dredged by Hyndman in 5-90 fathoms in Belfast Lough, and off Larne; and Mr. Swanston has taken it off White Head with the valves still united. Thompson gives "Belfast Bay" (*sub Artemis undata*). Miss Richardson has sent me a fresh and complete specimen from Portrush sands, evidently but recently dead. Like the preceding species, this would appear to be one of those shells which are dying out in the district, as, like it, while it is very rare in a live state, it is to be found in profusion and of large size in the post-tertiary clays in our estuaries.

Tellina crassa, *Pennant.*

Hyndman dredged a single living specimen on the Cod Bank, 3 miles north of Isle of Muck, 20 fathoms, gravelly bottom. In a dead state it has occurred in various localities, Strangford Lough included, in 10-30 fathoms—Thompson, Hyndman, and Dickie. Single valves are thrown up by the tide at Orlock Point, Co. Down, in some quantity—R.Ll.P.

Tellina Balthica, *Linné.*

Common between tide-marks on every shore. *Sub T. solidula* by the writers quoted above.

Tellina tenuis, *Da Costa.*

A common gregarious species, living in sand about low water mark. "The plaice in Belfast Bay feed very much on *T. tenuis*"—Thompson. Dead valves of both this species and the preceding dredged on the Turbot Bank, 25-30 fathoms, by Hyndman.

Tellina fabula, *Gronovius.*

"Not uncommon on extensive sandy beaches, as Magilligan, W.T. Found

from below low water mark to a few fathoms, on sand"—Thompson. Dickie dredged it living outside Strangford Lough, in 7-15 fathoms: Hyndman records dead specimens only.

Tellina squalida, *Pulteney.*

Not a common species anywhere; rare in our province, and in a dead state only. "Red Bay, Co. Antrim, Mrs. J. Thomson Tennant"—Thompson; specimens from this locality are in the Belfast Museum. Dredged by Hyndman on the Turbot Bank; in shallow water in Brown's Bay, Island Magee; and in 20 fathoms off Black Head (*sub T. incarnata*).

Tellina donacina, *Linné.*

Strangford Lough—Thompson; whether living or dead not specified. Dead in Strangford Lough—Dickie; and on the Turbot Bank—Hyndman. The latter obtained a single live specimen in 20 fathoms, gravel bottom, on the Cod Bank, north of Isle of Muck.

Tellina pusilla, *Philippi.*

"Dead, valves united, from the Turbot Bank sand"—Hyndman, 1859 Report (*sub T. pygmæa*).

Psammobia tellinella, *Lamarck.*

Living in Belfast and Strangford Loughs, and the waters adjoining, in depths ranging from 7 to 30 fathoms—Thompson, Hyndman, and Dickie. Dead valves were dredged in Larne Lough and other places.

Psammobia costulata, *Turton.*

A single valve, found by Jeffreys in Turbot Bank sand which was forwarded to him by Hyndman, is the only trace of this species in our province.

Psammobia Ferröensis, *Chemnitz.*

"Commonly thrown ashore on most sandy beaches. Inhabits below low-water mark"—Thompson. Hyndman and Dickie never seem to have taken it alive, but in a dead state it occurred in most of their dredgings. Thrown up alive by the tide at Castlerock, Co. Derry, and Cultra, Co. Down—R.Ll.P.

Psammobia vespertina, *Chemnitz.*

"From Larne Lough, Co. Antrim, a specimen has been sent me"—Thompson. This appears to be the only published note of its occurrence in the North of Ireland. I have before me over a dozen single valves, some of them quite fresh, which were picked up in about twenty minutes' search on the beach at Cultra, Co. Down; it evidently lives in some quantity at no great distance from that place.

Donax vittatus, *Da Costa.*

"Generally common on extensive sandy beaches. Plentiful close to low water mark at Magilligan, where it is collected by the people for food. Dredged plentifully, but of small size, on pure sand, at a few fathoms' depth, off Newcastle, Co. Down, Mr. Hyndman and W.T."—Thompson (*sub D. trunculus*). The dredgings of Hyndman and Dickie, being generally in

deeper water, do not fairly show its distribution: indeed, this common species was only obtained once—in Brown's Bay, Island Magee (*D. anatinus*). Portrush, Ballycastle, and a single valve at Ballyholme Bay—R.Ll.P.

[Donax denticulatus, *Linné.*

"A specimen said to be from Magilligan is in Mr. Hyndman's collection" —Thompson. This is a West Indian species, erroneously introduced into British lists.]

Mactra solida, *Linné.*

"Not generally distributed; Magilligan, Red Bay, and Larne"—Thompson. "A single valve dredged up off Castle Chichester, and odd valves off Bangor"—Hyndman. Dredged between Bangor and Donaghadee, 6-8 fathoms—Mr. S. A. Stewart (whether living or dead not stated). Portrush, dead, Miss Richardson. Dead valves are abundant at Magilligan, and are not uncommon on the shore beyond Groomsport, Co. Down—R.Ll.P.

var. **truncata.** "Found near low water mark in sand; brought to Belfast with cockles for sale, and together with *Venus aurea*, similarly obtained, commonly called 'Lady Cockle'; Red Bay, W.T."—Thompson. "Bangor Bay, Down (Patterson)"—Forbes and Hanley. "Living on sandy shores between tide marks"—Hyndman. Groomsport—Belf. Mus. Coll.

var. **elliptica.** "Belfast and Strangford Loughs; specimens dead in both localities"—Thompson. Dredged frequently by Hyndman, living, in 12 to 30 fathoms; dead shells common on the Turbot Bank. Dickie took it alive in Strangford Lough and the channel outside. (All *sub M. elliptica*).

Mactra subtruncata, *Da Costa.*

"Dredged from 10 to 12 fathoms, on sand, in Strangford Lough, Mr. Hyndman and W.T."—Thompson. "Living, few," in Brown's Bay, Island Magee, 4 fathoms and less—Hyndman. Groomsport—Belf. Mus. Coll.

var. **inæquivalvis.** "Lough Strangford (Adair)"—Jeffreys; which is the only station assigned by that eminent conchologist to this variety.

Mactra stultorum, *Linné.*

Living on sandy beaches near low water mark; rather local. Red Bay, Co. Antrim, and Newcastle, Co. Down—Thompson. Being a littoral species, it did not occur in any of Hyndman's or Dickie's dredgings. Portrush, and abundant on the Derry coast, and frequently washed up alive on the Co. Down shore from Holywood to Donaghadee—R.Ll.P.

var. **cinerea.** Magilligan—Thompson.

Under the various species and varieties of the above rather critical genus, I have simply placed the notes on them by the observers named, without comment, but there seems to have been some confusion regarding *M. solida* var. *truncata* and *M. subtruncata*, at least. Contrary to what the notes above might lead one to expect, it is the latter that is by far the more abundant of the two in our district, living in profusion in Belfast Lough and elsewhere, and it is to

it that I have always heard the name "Lady Cockle" applied. Beyond the records given, I do not know of *M. solida* var. *truncata* having been taken in the neighbourhood.

Lutraria elliptica, *Lamarck.*

Burrowing deeply in sand and mud, at and below low water mark; common. "Like *Mya arenaria*, plentiful in localities on all sides of the coast" —Thompson (*sub L. vulgaris*). Dredged occasionally (dead) by Hyndman, and alive in 12-15 fathoms by Dickie off Strangford Lough. Newcastle, Ballyholme, Cultra, Redbay, Ballycastle and Portrush may be mentioned as localities, and on the Derry coast it is very abundant. Rev. Canon Grainger, D.D., informs me that the young shells of this species are called "aprons" on Magilligan strand.

Lutraria oblonga, *Chemnitz.*

"Magilligan, Mr. Hyndman"—Thompson (*sub L. hians*).

Scrobicularia prismatica, *Montagu.*

Magilligan, Belfast Bay, and from 50 fathoms off the South Rock, Co. Down —Thompson (*sub Amphidesma prismatica*). "Living, rare, in 20 fathoms off Black Head", and frequent in a dead state, 1-27 fathoms—Hyndman; living both in and outside of Strangford Lough, in 7-20 fathoms—Dickie (*sub Syndosmya prismatica*).

Scrobicularia nitida, *Müller.*

Near Portaferry in Strangford Lough—Thompson (*sub Amphidesma intermedia*). Living, rare, in deep water off Belfast Lough, and in 4-5 fathoms in Larne Lough—Hyndman (*sub Syndosmya intermedia*). Dickie dredged it alive in 15 fathoms in Strangford Lough, and also, in abundance, in 25-26 fathoms in the open channel, 6-7 miles from the bar, on a bottom of fine mud.

Scrobicularia alba, *Wood.*

Belfast and Strangford Loughs, sparingly, oozy sand, 8-10 fathoms— Thompson (*sub Amphidesma Boysii*). Living in Belfast Lough, in 8 to 12 fathoms—Hyndman; and in Strangford Lough, in 6 to 20 fathoms—Dickie (*sub Syndosmya alba*). In a dead state it has been dredged at all depths. Living, common, in 6-8 fathoms off Bangor—Mr. S. A. Stewart.

var. **curta.** "Lough Strangford (Waller); Larne, Co. Antrim (J.G.J.)"— Jeffreys.

Scrobicularia tenuis, *Montagu.*

"I have received specimens of this well-marked species from Larne Lough, County of Antrim"—Thompson. Thompson's specimens from this locality are in the Belfast Museum. It does not appear to have been found since.

Scrobicularia piperata, *Bellonius.*

"This should not perhaps have been noted in the Belfast Bay column, as though not uncommon in a dead state, it has not been found alive to my knowledge"—Thompson (*sub Lutraria compressa*). "Has not been found living,

but is probably to be found"—Hyndman. Like *Tapes decussatus*, this species appears to stop short on the borders of our province, as it lives in Carlingford Lough (R.Ll.P.), and abounds further southward, while it has never been taken alive further north. Like *T. decussatus*, too, it occurs in profusion in our Estuarine Clays, whence are probably derived the odd valves which are found in Belfast Lough and elsewhere.

Solecurtus candidus, *Renier.*

Dead; dredged by Hyndman on the Turbot Bank, and by Dickie in 12-15 fathoms outside Strangford Lough. Very rare.

Solecurtus antiquatus, *Pulteney.*

"Red Bay and Larne Lough, Co. Antrim—Strangford Lough, 8-10 fathoms, soft sand, W.T."—Thompson (*sub Solen antiquatus*). Hyndman dredged it several times, in a dead state, off Black Head, in 15 to 30 fathoms. In Strangford Lough, Dickie obtained it in almost every haul of the dredge, but never alive. (By Hyndman and Dickie *sub S. coarctatus*).

Ceratisolen legumen, *Linné.*

The following from Thompson (*sub Solen legumen*):—"'Plentiful on the East coast from Cork to Belfast', Brown's Illust. p. 113, 2nd edit. This remark gives quite too extensive an idea of its distribution. Specimens from the extensive sandy coasts of Dublin and Louth only have come under my notice; if the species be found so far North as Down, it must be only on the more southern part of it". Newcastle, Co. Down—Belf. Mus. Coll.; and Mr. Swanston has a fresh and complete specimen, and also a fresh single valve, which he found thrown up by the tide at this place.

Solen pellucidus, *Pennant.*

A rather common species, living in all our bays and in the deeper waters, on sand and mud, in depths varying from 3 to 25 fathoms. Thompson mentions that plaice caught on the northeast coast have sometimes their stomachs filled with remains of this shell.

Solen ensis, *Linné.*

Common in sandy bays throughout the province.

Solen siliqua, *Linné.*

"Most common of the genus on our coast generally"—Thompson. Dead valves have been dredged in up to 90 fathoms, but the habitat of the species is in sandy bays between tide-marks, where it is abundant. As noted by Hyndman, very fine specimens are to be found at Ballyholme Bay, Co. Down.

Solen vagina, *Linné.*

"A specimen has been given me as from Larne Lough"—Thompson. "On the Irish coast it is local, inhabiting very extensive sandy beaches, as those of Magilligan, and of the counties of Dublin and Cork (Thompson). In eight fathoms, Bangor, County Down, dead (Patterson)"—Forbes and Hanley. "Dead, off Bangor, Co. Down" is Hyndman's only note of it (*sub S. marginatus*), and Dickie's dredgings never yielded it. This species, which is so rare

in our present waters, occurs throughout our later post-tertiary deposits, while *S. siliqua*, which is not found in these beds, appears to have now taken its place, being abundant in suitable localities.

Pandora inæquivalvis, *Linné.*

var. **obtusa.** "Dredged off Carrickfergus, Mr. Hyndman; subsequently by Mr. Hyndman and myself in Strangford Lough"—Thompson. Taken alive off Black Head and Donaghadee, in 15 to 20 fathoms, by Hyndman; and off the entrance of Strangford Lough, in 18-20 fathoms, by Dickie. (All *sub P. obtusa*). Dead on the Turbot Bank and elsewhere.

Lyonsia Norvegica, *Chemnitz.*

This curious shell is rare in the district. "Dredged in Belfast and Strangford Loughs, in from 6 to 12 fathoms, among seaweed"—Thompson. Living in from 8 to 12 fathoms in Belfast Lough, and dead on the Turbot Bank—Hyndman. Dickie took it alive in 15 to 25 fathoms in Strangford Lough, and dead in shallower water. Off Crawfordsburn, 6 to 7 fathoms, dead, but fresh and valves united—Mr. S. A. Stewart.

Thracia prætenuis, *Pulteney.*

Thompson says of it (*sub Anatina prætenuis*)—"'Belfast Lough, rare,' Brown. The latter locality probably a mistake. Magilligan is the only northern locality in which the species has yet been met with by Mr. Hyndman or myself; it is thrown ashore quite fresh there". Dredged by Hyndman in 15, 20 (valves united), and 27 fathoms off Belfast Lough, and in 20 fathoms off Larne, dead in each instance. "Coast of Down (Patterson)"—Forbes and Hanley. (All *sub Cochlodesma prætenue*). I have a valve found by my brother at Magilligan.

Thracia papyracea, *Poli.*

"Belfast and Strangford"—Thompson (*sub T. declivis*, Thor.). Dredged by Hyndman at various points around the entrance to Belfast Lough, in 20 to 30 fathoms, and by Dickie both in and outside of Strangford Lough, in 7-20 fathoms; in all instances dead (*sub T. phaseolina*). Dead, in 6-8 fathoms, off Bangor and Donaghadee—Mr. S. A. Stewart.

var. **villosiuscula.** Dead, in from 1 to 30 fathoms, off Belfast Lough and Island Magee—Hyndman (*sub T. villosiuscula*).

Thracia pubescens, *Pulteney.*

"Belfast Bay"—Thompson. On the Turbot Bank, rare, dead—Hyndman. "The reputed Irish localities are doubtful"—Jeffreys.

Thracia convexa, *W. Wood.*

"Difficult to procure on account of its habit of burrowing rather deeply in muddy sand"—Jeffreys, which may perhaps account for its not having been taken alive in the province. "In Strangford Lough"—Thompson; specimens from thence are in Thompson's collection in the Belfast Museum. "Not known to be now living in the Bay; two specimens have been dredged off

Black Head, broken, but with ligament fresh, so that it is probably still living" —Hyndman. Dickie took it three times in Strangford Lough, but dead in each case.

Thracia distorta, *Montagu.*

"In limestone near Belfast, with *Saxicava*, Mr. Grainger"—Thompson. The only other note is a repetition by Hyndman of this record.

Corbula gibba, *Olivi.*

"Strangford Lough is the best locality known to me for this species, in some parts of which it is common on muddy ground, at a depth of about from 4 to 10 fathoms"—Thompson (*sub C. striata*). Living in 12-20 fathoms off Belfast Lough, and in 1-90 fathoms off Larne and the Maidens—Hyndman. The results of Dickie's explorations in Strangford Lough amply confirm Thompson's note, as this shell was found in abundance, alive, at every station, 4 to 25 fathoms. Living, common, 8-10 fathoms, Belfast Bay—Mr. S. A. Stewart.

Mya arenaria, *Linné.*

A common littoral species, living in abundance in muddy estuaries. I have seen specimens of unusual size (3 x 5 inches) dug on the Holywood Bank for bait, and at Cultra have found small distorted individuals inhabiting the forsaken burrows of *Pholades*. Locally called "cockabrillion" or "cockle-brillion."

Mya truncata, *Linné.*

With the last, but frequenting more the open sea.

var. **abbreviata** was dredged by Hyndman and Jeffreys living in 80 fathoms off the Antrim coast, some 10 miles from land.

Mya Binghami, *Turton.*

Turbot Bank, living, rare—Hyndman (*sub Sphœnia Binghami*). Occasionally met with in a dead state.

Saxicava rugosa, *Linné.*

Burrowing in limestone and old shells, or free. "Common around the coast on the North and East"—Thompson. Living commonly in from 0 to 30 fathoms in the waters explored by Dickie and Hyndman; the latter dredged living examples in 70-90 fathoms near the Maiden Rocks.

var. **arctica.** With the typical form, but not so abundant, and inhabiting rather deeper water (*S. arctica*).

Venerupis Irus, *Linné.*

In Thompson's collection in the Belfast Museum, there are specimens of this shell labelled "Bundoran, Co. Donegal"; in the 4th volume of the "Natural History of Ireland" there is no mention of its occurrence there.

Pholas dactylus, *Linné.*

Burrowing in sandstone, marl, and hard clay, between high and low water mark, on both sides of Belfast Lough; Carrickfergus, Greenisland, and Cultra may be mentioned as localities where it may be taken alive.

Pholas candida, *Linné.*

The most common of the genus in Belfast Lough, inhabiting the same situations as the last. Dickie dredged dead valves in 7-20 fathoms in Castle Ward Bay, Strangford Lough.

Pholas parva, *Pennant.*

"Was procured some years ago off the Long Strand, Belfast Bay, by Dr. J. L. Drummond; subsequently by the Ordnance collectors at Whitehouse Point, in the same bay"—Thompson. Hyndman supplies the additional information that it was in submerged peat that it occurred in the former locality.

Pholas crispata, *Linné.*

"Belfast Lough, Brown. Inhabiting indurated clay about low water mark, Belfast Bay"—Thompson. "Living in submerged peat at extreme low-water in Bangor Harbour, County Down, and in other places—Hyndman. Castle Chichester, in Triassic marl, but of very small size—Mr. Swanston. It flourishes on the shore at Cultra, near low water mark, in Boulder Clay, New Red Sandstone, and Carboniferous Shale; at this place, from a piece of soft sandstone less than 6 inches square, the writer has taken *P. dactylus*, *P. candida*, *P. crispata*, and *Tapes pullastra* var. *perforans*, all living.

Pholadidea papyracea, *Turton.*

"Two specimens in the Ordnance Museum are labelled "Portrush", North of Ireland"—Thompson (*sub Pholas papyracea*). "Discovered in the dredgings of 1857, embedded in rolled lumps of hard clay, and again in the deep water this season" (1858)—Hyndman. Off the Maiden Rocks, 70-90 fathoms, is the station where these specimens, which were living, were obtained. In his 1859 Report, Hyndman again records it "living at the depth of 80 fathoms north of the Maidens, in small pieces of soft sandstone. The smaller specimens want the cup-shaped appendage, whether the effect of insufficient space or immature growth." Hyndman first recorded it as *Pholas striata*, but subsequently corrected it to the present species. "Sandstone at low-water, Castle Chichester near Belfast (Hyndman)"—Jeffreys; whence it has been obtained subsequently. Low water mark being its usual habitat, it is probable that all the deep water specimens above should go under the following variety, which is essentially a deep water form.

var. **aborta.** "In soft sandstone dredged in 80 f. off the coast of Antrim (J.G.J.)"—Jeffreys.

[**Teredo Norvegica,** *Spengler.*

"Donaghadee (Co. Down), the animal alive"—Thompson. "Not known as living in the Bay"—Hyndman. Probably stray specimens only have been met with here.]

CLASS SOLENOCONCHIA.

Dentalium entalis, *Linné.*

"On most parts of the Irish coast"—Thompson. The curious "tooth-shell" lives in some profusion on the Antrim and Down coasts, on sand and mud, in depths varying from 5 fathoms in Belfast Lough to 90 fathoms at the Maiden Rocks.

CLASS GASTEROPODA.

ORDER CYCLOBRANCHIATA.

Chiton fascicularis, *Linné.*

"Generally distributed"—Thompson. Living in Strangford Lough—Dickie, and Mr. S. A. Stewart.

var. **gracilis.** "Lough Strangford (Adair). A specimen from the last-mentioned locality measures nearly an inch and a half in length, while the largest that I have of the typical form (from Unst), is scarcely an inch long" —Jeffreys.

Chiton Hanleyi, *Bean.*

"A fine living specimen on a shell, and one on a stone, in 80 fathoms"—Hyndman, 1859 Report.

Chiton cancellatus (*Leach?*), *G. B. Sowerby, Jun.*

"Among oysters from Killinchy, Down, Templeton MSS. Found by Mr. Hyndman and myself in different localities on the North-East coast"—Thompson (*sub C. albus*, Mont.). Belfast Lough—Belf. Mus. Coll. "Living; not uncommon in deep water"—Hyndman.

Chiton cinereus, *Linné.*

"On most parts of the Irish coast"—Thompson. Frequent, living in 15-70 fathoms—Hyndman; and commonly in Strangford Lough, 4-20 fathoms—Dickie (*sub C. asellus*). Carrickfergus—Mr. Swanston.

Chiton albus, *Linné.*

"North coast of Ireland"—Thompson. "Strangford Lough"—Mr. S. A. Stewart. Belfast Lough—Belf. Mus. Coll.

Chiton marginatus, *Pennant.*

Among oysters from Killinchy (Temp. MSS.), in the stomach of a haddock taken at Newcastle, Co. Down, and in other localities on the North-East coast—Thompson (*sub C. fuscatus*, Brown). Though it is a common species generally, neither Hyndman nor Dickie has any note of it. Belfast Lough—Belf. Mus. Coll.

Chiton ruber (*Linné*), *Lowe.*

"Among oysters from Killinchy, Down, Temp. MSS. Found by Mr. Hyndman and myself in different localities on the North-East coast"—Thompson. Living in 15-25 fathoms north of Larne—Hyndman; and in and about Strangford Lough in 7-20 fathoms—Dickie. Belfast Lough—Belf. Mus. Coll.

Chiton lævis (*Pennant*), *Montagu.*

Living, very rare, in Castle Ward Bay, Strangford Lough, 7-20 fathoms—Dickie. Belfast Lough—Belf. Mus. Coll.

Chiton marmoreus, *Fabricius.*

"Obtained in Strangford Lough by Mr. Hyndman and myself. On oysters brought to Belfast market from Carlingford, and Greencastle (Co. Londonderry), W. T.; Bangor, Co. Down, Mr. R. Patterson"—Thompson (*sub C. lævigatus*). Strangford Lough—Mr. S. A. Stewart.

ORDER PECTINIBRANCHIATA.

Patella vulgata, *Linné.*

Between tide marks, on stones and rocks; very common here, as elsewhere. Hyndman dredged dead shells in 27 fathoms on the Turbot Bank. He makes a curious statement about the limpet on the authority of Captain White, Harbour Master—that it is found to be good for eating and wholesome on the outer coast of Co. Down, but that in Strangford Lough it is found not to be wholesome, and is avoided by the people there. There is an interesting paper in the "Annals of Natural History" for June, 1839, by the late Mr. Robert Patterson, F.R.S., on the use of the limpet as food in the North of Ireland, which will well repay perusal.

var. **depressa.** "Living. Coast of Down, in Mr. Hyndman's cabinet"—Hyndman, 1859 Report (*sub P. athletica*). Bangor, Co. Down—Belf. Mus. Coll.

Helcion pellucidum, *Linné.*

Of general occurrence round our shores, on the broad fronds of *Laminaria digitata*, at and near low water mark. Dickie brought up living specimens from as deep as 15 fathoms in Wellstream Bay, Strangford Lough, and Hyndman dredged it dead on the Turbot Bank (*Patella pellucida*).

var. lævis. Equally distributed with the typical form, and not separated from it by the authors quoted above.

Tectura testudinalis, *Müller.*

On stones at and below low water mark. Newcastle and Bloody Bridge—Thompson (*sub Lottia testudinalis*). Frequent on both sides of Belfast Lough—Hyndman; and dead specimens were dredged in Strangford Lough by Dickie, and Mr. S. A. Stewart (*Acmæa testudinalis*). This shell was named by Sowerby *Patella Clealandi* in honour of Mr. J. Rose Clealand, of Rathgael House, who procured the first British examples at Bangor, Co. Down; but as a species it proved to have been previously described and named by Müller, from Danish specimens. On stones near the Twin Islands, Belfast Harbour, of large size—Mr. Swanston.

Tectura virginea, *Müller.*

"Obtained on the shore of Belfast Bay by Mrs. M'Gee, and found by Mr. Hyndman adhering to oysters in Belfast Market in 1831"—Thompson (*sub Lottia virginea*). Hyndman took it very frequently, living at the entrance to Belfast Lough, and off Larne, in from 10 to 25 fathoms; and from Dickie's dredgings it would appear to live in abundance in Strangford Lough, in 4 to 25 fathoms (*sub Acmæa virginea*). Dead shells frequent on the Turbot Bank.

Tectura fulva, *Müller.*

Turbot Bank, rare, dead; determined by Dr. Dickie—Hyndman, 1858 Report (*sub Pilidium fulvum*).

Propilidium ancycloides, *Forbes.*

"Obtained by Mr. Hyndman many years ago on oysters from Strangford Lough"—Thompson (*sub Patella ancycloides*). In a dead state it is rather common on the Turbot Bank. The only locality on our shores where it has been certainly taken alive would appear to be the deep water near the Maiden Rocks, where Hyndman procured living specimens several times, in between 70 and 100 fathoms of water. Jeffreys says "on the Antrim Coast in 18-100 fathoms (Hyndman and others)," which looks as if some other observer had taken it at a less depth.

Puncturella Noachina, *Linné.*

"Mouth of Belfast Bay, 27 fathoms, one dead specimen dredged by Mr. Hyndman"—Thompson; his only Irish note of the species. Hyndman subsequently obtained it on several occasions on the Turbot Bank (the same locality), always dead. Jeffreys says of it—"Co. Antrim (Hyndman, Waller, and J.G.J.). The specimens, however, from the last-mentioned locality are probably relics of the glacial epoch, and not recent." It is a species essentially of northern origin, whose most southern station is Scarborough in Yorkshire, while northward it ranges as far as Spitzbergen and North Greenland.

Emarginula fissura, *Linné.*

Common off the South Antrim coast, living in depths varying from 5 fathoms in Belfast Lough to 90 fathoms near the Maiden Rocks—Hyndman; it was not taken alive in Strangford Lough, but was common in a dead state —Dickie (*sub E. reticulata*). Thrown up by the tide on sandy beaches at Castlerock and Magilligan, Co. Derry, and Newcastle, Co. Down—R.Ll.P.

***var.* elata.** Jeffreys records this variety, which is larger, more solid, and much higher than the typical form, as taken by him at "Larne near Belfast."

Emarginula rosea, *Bell.*

Hyndman states that this shell was dredged, in a dead state, by Mr. Waller on the Turbot Bank. It is entirely a southern form, inhabiting, as a British species, the Channel Islands and South of England coasts, and its occurrence here as a native would be, to say the least of it, highly improbable.

Emarginula crassa, *J. Sowerby.*

Very rare, living in 60 fathoms off the Copeland Islands; dead in shallower water in the same vicinity, and on the Turbot Bank, and in 70-100 fathoms near the Maidens—Hyndman. Dredged alive off the Maidens—Mr. Swanston. It is a species of great beauty and rarity, inhabiting rocky ground in deep water, where it is almost inaccessible to the dredge.

Fissurella Græca, *Linné.*

"On all the Irish coasts"—Thompson. Living sparingly in 10 to 25 fathoms at various points of the Antrim and Down coasts—Hyndman, and Dickie (*sub F. reticulata*). Portrush—Miss Richardson. Magilligan and Castlerock, Co. Derry, dead—R.Ll.P.

Capulus Hungaricus, *Linné.*

"Generally distributed"—Thompson (*C. Ungaricus*). Not uncommon, living on stones and oyster shells in 10 to 20 fathoms, off Belfast Lough and Larne. In a dead state it has been dredged by Dickie in Strangford Lough, and by Hyndman in the deepest water off the Maidens (100 fathoms). Rather worn shells are thrown ashore by the tide at Magilligan and Newcastle—R.Ll.P. Hyndman and Dickie mention it under Lamarck's generic name of *Pileopsis*. Locally called "fool's cap."

[Haliotis tuberculata, *Linné.*

"'Dredged near Groomsport, Co. Down, Oct. 1811,' Templeton, MSS."—Thompson. The two specimens affirmed to have been there obtained are preserved in the Belfast Museum, on a card which bears the following manuscript note by Mr. Robert Templeton:—"These are the two haliotes which rank this shell as a native of Ireland. They were got by the late John Templeton, Esq., I believe on the Co. Down shore—R. T." Jeffreys dismisses this and other records with very little ceremony—"the Irish localities must have been from hearsay, and are manifestly wrong." It would appear probable that the Groomsport specimens were actually obtained there, for

Mr. Templeton's care and accuracy are well known, but they must have been derived from some passing vessel or other extraneous source; this beautiful species inhabits nowhere north of the Channel Islands.]

Scissurella crispata, *Fleming.*

A northern species, frequenting, in Britain, chiefly the Orkney and Shetland Islands. "Mouth of Belfast Bay, 27 fathoms, 2 dead specimens dredged by Mr. Hyndman"—Thompson. In Hyndman's Reports, additional specimens are mentioned as having been obtained on the Turbot Bank, and a single fresh shell was taken in 80 fathoms some 6 miles north of the Maidens.

Cyclostrema nitens, *Philippi.*

Found by Jeffreys in Turbot Bank sand sent to him—Hyndman, 1858 Report (as *Trochus* (*Margarita*) *pusillus*).

Cyclostrema serpuloïdes, *Montagu.*

In Turbot Bank sand, as last (*sub Skenea divisa*); and in his 1859 Report Hyndman records having dredged living examples off Larne.

[Margarita costulata, *Möller.*

Found by Mr. Waller in Turbot Bank sand—Hyndman. It is an arctic species, whose southern limit is Iceland. Dead specimens have been dredged in several Scotch localities also, which, with those from the Turbot Bank, must be looked on as relics of the great ice age.]

Trochus helicinus, *Fabricius.*

"Living, common, on *Laminaria digitata, &c.*"—Hyndman. Assuming that *Margarita communis*, Mont. = *M. vulgaris*, Leach, Thompson mentions the loughs of Belfast, Larne, and Strangford as localities. Hyndman dredged dead specimens on the Turbot Bank.

var. **fasciata.** "Found by Mr. Hyndman in the North of Ireland"—Jeffreys.

Trochus Groenlandicus, *Chemnitz.*

Dredged in a dead state by Hyndman on the Turbot Bank (*sub T.* (*Margarita*) *undulatus*). The specimens were determined by Jeffreys, who, however, remarks that they look suspiciously like fossils from a submarine post-tertiary deposit in the locality. It is an arctic species, which descends as far southward as the north of Scotland.

[Trochus cinereus, *Couthouy.*

"Has been dredged by Mr. Waller on the Antrim Coast; but it is a submarine fossil"—Jeffreys. Hyndman also records it, as *Margarita cinerea.*]

Trochus magus, *Linné.*

Not uncommon on the coasts of Derry, Antrim, and Down, living chiefly in about 5 to 10 fathoms.

Trochus tumidus, *Montagu.*

Belfast and Strangford Loughs, and Donaghadee—Thompson. Hyndman dredged it very frequently, living in depths ranging from 10 to 100 fathoms,

and from Dickie's lists it would appear to live in profusion in Strangford Lough.

Trochus cinerareus, *Linné.*

One of our most common species, living on stones and sea-weed between tide-marks and in depths up to 25 fathoms, throughout the province. Hyndman dredged a single living specimen in the great depth of 70-90 fathoms off the Maidens. It is locally called "silver-shell," on account of the pearly lustre of the inner layers. The *T. littoralis*, Brown, for which Thompson, quoting from an older writer, mentions Killough as a station, belongs to the present species, and, according to Jeffreys, can scarcely be considered a variety.

Trochus umbilicatus, *Montagu.*

Between tide-marks, among stones and *Fuci*; common.

Trochus Duminyi, *Requien.*

Our rarest shell, Bundoran in Donegal Bay being its only British habitat. It appears to be of rather rare occurrence there, where it was first discovered some years ago by Edward Waller, an assiduous and distinguished Ulster conchologist.

Trochus lineatus, *Da Costa.*

"This littoral species, found on rocks, stones, &c., is unknown to me further north on the Eastern line of coast than Ballywalter, Co. Down (54½° lat.). Southward it is common"—Thompson (*sub Monodonta crassa*). On the western side of the province it flourishes at Bundoran, in just the same latitude—Waller, Jeffreys, and others.

Trochus Montacuti, *W. Wood.*

Sparingly but widely distributed on the Antrim and Down shores. Hyndman dredged it alive off Ballygalley Head, Waller off Groomsport, and Dickie in Strangford Lough and the open channel adjoining—depths ranging from 12 to 25 fathoms; in a dead state it occurred frequently, especially on the Turbot Bank (*sub T. Montagui*). A very elegant scalariform monstrosity was dredged off Larne, as noted by Hyndman and Jeffreys.

Trochus striatus, *Linné.*

"Dead, in Turbot Bank sand, Mr. Jeffreys"—Hyndman, 1859 Report; specimens from that locality are in the Belfast Museum Collection. In his "British Conchology," the most northern station which Jeffreys gives is Dublin Bay. It is a southern species, and frequents the Channel Islands and south coasts of England and Ireland.

[Trochus exasperatus, *Pennant.*

"Turbot Bank, Dr. Dickie, doubtful"—Hyndman, 1857 Report (*sub T. exiguus*). This is the only note of the occurrence of the present species. Jeffreys regards as doubtful all localities other than those on the South of England coasts and Channel Islands.]

Trochus millegranus, *Philippi.*

Of not uncommon occurrence, living in depths varying from 10 fathoms in Belfast Lough to 100 fathoms at the Maiden Rocks; Dickie includes it in his lists of Strangford Lough shells. Thompson says—"It inhabits the deeper portions of Belfast and Strangford Loughs, chiefly from 10 to 23 fathoms, in sand ooze, &c. Bundoran, Mrs. Hancock. *T. Clelandi*, Wood, is considered another variety. It was sent to the Author from Strangford Lough by James Rose Clealand, Esq." Dredged at Glenarm, Mr. S. A. Stewart.

Trochus granulatus, *Born.*

This handsome shell, the largest British *Trochus*, is of extreme rarity in our province. "Two broken specimens dredged up at separate times in Belfast Bay; but as there are only two other examples known of its being found so far from its usual southern habitat, these have been no doubt introduced accidentally"—Hyndman, 1857 Report. "Fragments in 25 fathoms, 2 miles off Black Head"—*Ibid.*, 1858 Report. It has been dredged off the Mull of Galloway, and at Sanda Island, opposite the Antrim coast, so its occurence on our shores is not improbable. I find the following marginal note in Mr. Wm. Swanston's copy of Thompson's work, opposite the name (*T. papillosus*, Brown) of this species: "One living and one dead, S.E. of Maidens, 72 fathoms, 11th Sept., 1882—W. S." The specimens are in Mr. Swanston's cabinet, and are fine and characteristic examples.

Trochus zizyphinus, *Linné.*

A pretty and well-known species, which is distributed throughout our waters, and has been taken alive at all depths. It flourishes most in from about 5 to 25 fathoms.

var. **Lyonsii.** "The pure white variety has been dredged of all sizes, but very sparingly, in Belfast Lough by Mr. Hyndman and myself; on one occasion we found numbers of this variety on the beach at Ardmillan (Strangford Lough), whence they were brought adherent to "wrack" (*Fuci*) cut for manure about some of the islands"—Thompson. Hyndman took it living in from 20 to 90 fathoms off Larne, and Dickie in Strangford Lough.

var. **elata.** "Deep water on the coast of Antrim (J. G. J.)"—Jeffreys.

Phasianella pulla, *Linné.*

"Littoral in some localities; dredged in from about 6 to 10 fathoms in Belfast Bay, common"—Thompson. Living, frequent, near low water mark—Hyndman; it was dredged by him alive in as deep as 20 fathoms on the Cod Bank off Larne. In a dead state it is abundant in the shell sand of the Turbot Bank, and Dickie records it from Strangford Lough.

Lacuna crassior, *Montagu.*

Frequent, ranging from low water mark to the deepest water at the Maidens. Thompson and Dickie took it in Strangford Lough.

Lacuna divaricata, *Fabricius.*

A common species. "The var. *L. vincta* is not uncommon; *L. canalis* is

more so"—Thompson (*sub L. quadrifasciata*). "Common on *Laminaria*"—Hyndman (*sub L. vincta*). Abundant in Turbot Bank sand, in a dead state.

Lacuna puteolus, *Turton.*

Apparently rare. Dredged by Hyndman, in a dead state, on the Turbot Bank, and near Ballygalley Head. Strangford Lough—Mr. S. A. Stewart. Bundoran—Belf. Mus. Coll.

var. **conica.** "Co. Antrim (Hyndman)"—Jeffreys.

Lacuna pallidula, *Da Costa.*

"Inhabits the laminarian region in Belfast and Strangford Loughs, and chiefly found on the broad fronds of *Laminaria digitata*; also on oysters; occurs but sparingly; procured in some quantity at Ballycastle by the Rev. Thomas Hincks"—Thompson. "Living, common, on *Laminaria*"—Hyndman. Magilligan—Belf. Mus. Coll.

Littorina obtusata, *Linné.*

Abundant on stones and *Fuci* on all beaches. Hyndman dredged dead shells on the Turbot Bank (*L. littoralis*). "Common around the shores"—Thompson (*L. Neritoides*, Forbes).

var. **neritiformis.** "Captain Brown has given Downpatrick as an Irish locality"—Jeffreys.

var. **fabalis.** "I have found it plentifully at Larne in the North of Ireland. I believe it represents the young males of the ordinary form"—Jeffreys.

Littorina neritoides, *Linné.*

On rocks and stones above high water mark; common. Bundoran—Thompson (*L. petræa*, Mont.).

Littorina rudis, *Maton.*

Plentiful on stony beaches everywhere.

var. **saxatilis.** "North of Ireland"—Thompson (*L. saxatilis*).

var. **jugosa.** "Is common on all quarters of the rocky coasts"—Thompson (*L. jugosa*).

var. **patula.** "Living, common, on rocky ground a little below high water mark"—Hyndman (*L. patula*). Is this correct? Jeffreys gives only three stations in Britain—Eddystone, Penzance, and Unst.

var. **tenebrosa.** "Although met with on all sides of the coast, it is local"—Thompson (*L. tenebrosa*). It is an estuarine form, and occurs on our *Zostera* banks. Larne Lough—Hyndman. Fair Head—Belf. Mus. Coll.

Littorina litorea, *Linné.*

In the greatest abundance on stones and mud banks. "Abundant round the shores of the Island"—Thompson (*L. communis*, Turt. Br.).

var. **turrita.** Belfast Lough, Mr. S. A. Stewart—Belf. Mus. Coll.

Genus **Rissoa,** *Fréminville.*

Of this large genus of tiny shells, out of the 25 species which Jeffreys in-

cludes in the British catalogue, 20 are recorded as occurring in our province. The *Rissoæ*, and that other large genus of small univalves, the *Odostomiæ*, will serve as good examples of the richness in the smaller univalves of that interesting area of sand and gravel which is known as the Turbot Bank. Thus, of the 20 species of *Rissoa* found in the district, 18, or all but 2, occur in the shell-sand from this vicinity, about half of these being inhabitants of the littoral and laminarian regions, while the other half frequent the coralline and deep-sea zones. As regards *Odostomia*, to be mentioned presently, we have 24 species, out of 34 British, of which no less than 21 occur in the Turbot Bank sand, and 10 of these have not been obtained elsewhere in our waters. As suggested by Mr. Hyndman, the home of the majority of this large number of species, whose deserted habitations bestrew the Turbot Bank, is probably the profound rocky depths near the Maidens, where they may live, out of reach of the trawl and dredge.

NOTE.—Except where otherwise stated, the shells referred to in the notes on species of *Rissoa*, were dead.

Rissoa striatula, *Montagu.*

Bundoran—Thompson. Frequent on the Turbot Bank—Hyndman.

Rissoa cancellata, *Da Costa.*

Of frequent occurrence on the Turbot Bank—Hyndman. Dredged in Strangford Lough, and the open channel adjoining—Dickie. (Both *sub R. cronulata*).

Rissoa calathrus, *Forbes & Hanley.*

Turbot Bank, rare—Hyndman.

Rissoa reticulata, *Montagu.*

Common on the Turbot Bank—Thompson, and Hyndman. Common, 7-20 fathoms, Castle Ward Bay, Strangford Lough—Dickie. (All *sub R. Beanii*). In shell-sand dredged near Ardmillan in the latter lough—R.Ll.P.

Rissoa cimicoides, *Forbes.*

"Larne, Co. Antrim (J.G.J.)"—Jeffreys. The Turbot Bank is probably the locality intended. Specimens in the Belfast Museum Collection are labelled as from Larne.

Rissoa punctura, *Montagu.*

Bundoran—Thompson. Common on the Turbot Bank—Hyndman.

Rissoa Zetlandica, *Montagu.*

On the Turbot Bank—Hyndman. Specimens from thence are in the Belfast Museum Collection.

Rissoa costata, *Adams.*

Bundoran—Thompson. On the Turbot Bank, and in about 20 fathoms off Ballygalley Head—Hyndman. Strangford Lough—Dickie, and R.Ll.P.

Rissoa parva, *Da Costa.*

"A very common species around the coast"—Thompson. It lives in

profusion on *Zostera* and *Algæ* at low water mark and a few fathoms depth. Dead on the Turbot Bank and elsewhere.

var. **interrupta.** Common around the coast—Thompson (*R. interrupta*).

Rissoa inconspicua, *Alder.*

"One specimen at Bundoran, Mrs. Hancock"—Thompson. Frequent on the Turbot Bank—Hyndman.

Rissoa albella, *Levén.*

Turbot Bank; from Hyndman's collection—Belf. Mus. Coll. I find no note of it in Hyndman's Reports. If the determination of the species be correct, the specimens probably belong to the variety *Sarsii*, which is abundant along the west coast of Scotland; the typical form is confined to Bantry Bay, according to Jeffreys.

Rissoa membranacea, *Adams.*

"Bundoran, Warren. On muddy banks, within and below low water, it is common and fine in Belfast Bay"—Thompson, who remarks that he is informed that this species lives on the leaves of the "sleech-grass" (*Zostera marina*), and never, like other *Rissoæ*, on *Fuci*. A common species, living on *Zostera* banks throughout the district. Dead on the Turbot Bank, and in deep water in and outside of Strangford Lough—Hyndman, and Dickie. (*R. labiosa* by all).

Rissoa violacea, *Desmarets.*

Bangor, Belfast Bay—Thompson. "Living, scarce, on sea-weed between tide-marks"—Hyndman. Dead, common, Castle Ward Bay, Strangford Lough—Dickie. (All *sub R. rufilabrum*). It is one of the two North of Ireland *Rissoæ* which alone are not recorded from the Turbot Bank.

Rissoa striata, *Adams.*

This tiny shell swarms around our shores, on sea-weeds, stones, and mud, between tide-marks. Common also, in a dead state, in up to 30 fathoms of water on the Antrim and Down coasts.

Rissoa proxima, *Alder.*

"Magilligan (W.T.); Bundoran (Mrs. Hancock)"—Thompson. Turbot Bank, very rare—Hyndman. It is a rare and critical species, and as it has a southern distribution, and Dublin is the most northern station given by Jeffreys, it is possible that Thompson's localities belong to the following species.

Rissoa vitrea, *Montagu.*

Turbot Bank, extremely rare—Hyndman.

Rissoa fulgida, *Adams.*

"I have found it sparingly at Larne Lough, near Belfast"—Jeffreys.

Rissoa soluta, *Philippi.*

In Turbot Bank sand, very rare—Hyndman. Specimens from thence are in the Belfast Museum Collection.

Rissoa semistriata, *Montagu.*

"*R. semistriata* has come under my inspection in shell-sand from Magilligan and Bundoran"—Thompson. On the Turbot Bank, rare—Hyndman.

var. **pura.** Observed in Turbot Bank sand by Mr. Jeffreys—Hyndman (*sub* var. *alba*).

Rissoa cingillus, *Montagu.*

On all sides of the coast"—Thompson (*R. cingilla*). "Living, common, under stones near low water mark"—Hyndman. Dead shells in the deeper water.

var. **rupestris.** "North-East coast, Mr. Hyndman and W. T., not rare"—Thompson. Turbot Bank, rare—Hyndman.

[**Rissoa Bryerea,** *Montagu.*

"Among shell-sand from Magilligan, one procured by Mr. Hyndman"—Thompson. This is *Rissoina Bryerea*, a West Indian species, stray examples of which have been occasionally found at different places in the British Isles.]

[**Rissoa dispar** (Turbo dispar, *Montagu*).

Thompson, quoting from Brown, says that this species has been met with on the rocks near the Giant's Causeway. It is *Littorina dispar*, a West Indian shell, and has no claim to be considered British.]

Hydrobia ulvæ, *Pennant.*

Swarming on *Zostera* banks and muddy sands in all our bays and estuaries, between tide marks. Dead on the Turbot Bank—Hyndman (*Rissoa ulvæ*). In summer it is the chief food of the grey mullet. In winter various sea-birds feed on it.

Barleeia rubra, *Montagu.*

"Among sea-weed brought from Tory Island, off the north coast of Donegal, by Mr. Hyndman, in 1845, this species was found"—Thompson (*sub Rissoa rubra*). "Bundoran, Co. Donegal (J.G.J.)"—Jeffreys. Specimens from the latter station are in the Belfast Museum.

Jeffreysia diaphana, *Alder.*

"In shell-sand collected at Bundoran by Mrs. Hancock, in 1840"—Thompson (*sub Rissoa albella*, Alder).

Skenea planorbis, *Fabricius.*

This tiny shell abounds on *Zostera* and *Algæ* between tide-marks. Abundant in Belfast and Strangford Loughs; Bundoran, Mr. Warren—Thompson (*sub S. depressa*). Larne Lough—R.Ll.P. Dead shells in Turbot Bank sand—Hyndman.

var. **trochiformis.** Larne Lough—Jeffreys. This is the convex-spired variety mentioned by Hyndman in his 1859 Report.

Homalogyra atomus, *Philippi.*

"Living on *Zostera marina*, shores of Larne Lough"—Hyndman (*sub Eumphalus nitidissimus*). "Donegal in Ireland (Warren)"—Forbes and

Hanley (*Skenea nitidissima*). Belfast Lough—Belf. Mus. Coll. Has probably been passed over on account of its very minute size; it would seem to be a common species generally.

Homalogyra rota, *Forbes & Hanley.*

"This rare species has been taken in Donegal by Mr. Warren and Mr. Barlee"—Forbes & Hanley (*sub Skenea? rota*). It is the smallest known species of British shells, having a length, according to Jeffreys, of only 0·0115 inch, and is rare.

Cæcum trachea, *Montagu.*

Turbot Bank; from Hyndman's collection—Belf. Mus. Coll. "Strangford (Waller)"—Jeffreys (supplement).

Cæcum glabrum, *Montagu.*

"Shell-sand, deep water, Belfast Bay, Mr. Hyndman"—Thompson (*sub Brochus lævis*). Rare, in shell-sand from the Turbot Bank—Hyndman. These refer to the same station, and are the only notes of the occurrence in our district of the species, which Jeffreys says is common and universal; its insignificant size may account for this.

[**Brochus reticulatus** of Brown is the young of his *B. annulatus*, which is an exotic shell. It is said to have been found in Strangford Lough.].

Turritella terebra, *Linné.*

Very common, living in 7 to 25 fathoms throughout our waters. Thompson says Mr. Hyndman observed it living between tide-marks in Carlingford Lough. In Lough Foyle the dead shells of this species constitute a large part of the great shell-banks for which the place has long been noted.

[**Truncatella truncatula,** *Draparnaud.*

"A specimen agreeing with Montagu's description of *Turbo subtruncata*, but not very well with his figure, was found among shell-sand collected at Bundoran by Mrs. Hancock"—Thompson (*sub T. Montagui*). "I fear there has been some mistake as to the specimen from this place"—Jeffreys. Its British distribution only extends to the south coast of England and the Channel Islands, and its foreign range is entirely southern.]

Scalaria Turtonæ, *Turton.*

"At Newcastle, Co. Down, this shell has been met with by Dr. Drummond"—Thompson. This station is given also by Forbes and Hanley, and Jeffreys, on Thompson's authority. Strangford Lough—Mr. S. A. Stewart. As a pleistocene fossil it is of common occurrence in the Estuarine Clays at Belfast; perhaps the specimens labelled "Belfast Lough" in the Museum Collection were thus derived.

Scalaria communis, *Lamarck.*

"Although not yet (so far as I am informed) taken in the Loughs of Strangford or Belfast, it has been procured in the adjacent Lough of Larne; Bundoran, Mrs. Hancock"—Thompson (*sub S. clathrus*). Turbot Bank, dead, rare—Hyndman. Magilligan—Belf. Mus. Coll.

Scalaria Trevelyana, *Leach.*

"Mr. Hyndman possesses a specimen from Magilligan"—Thompson; a specimen from thence, out of Mr. Thompson's collection, is in the Belfast Museum. It does not appear to have been taken elsewhere in the province.

Scalaria clathratula, *Adams.*

"Bundoran, Mrs. Hancock"—Thompson; specimens from thence are in the Belfast Museum. Hyndman dredged dead shells on several occasions, in the vicinity of the Turbot Bank.

[Acirsa borealis, *Beck.*

"Dead, in Turbot Bank sand, Mr. Waller, 1857. Described by him in the "Transactions of the Royal Dublin Society," and provisionally named *Turritella Hibernica*"—Hyndman (*sub Scalaria Eschrichti*). "Dredged in 18-20 f. off the coast of Antrim, by Mr. Hyndman, Mr. Waller, and myself. This species has not been found living south of Iceland"—Jeffreys.]

Aclis unica, *Montagu.*

"Bundoran, Mrs. Hancock. Deep water, Belfast Bay, Mr. Hyndman"—Thompson (*Chemnitzia unica*). Turbot Bank, dead, very rare—Hyndman. It is a littoral species.

Aclis ascaris, *Turton.*

"Bundoran (Mrs. Hancock, *fide* Thompson)"—Jeffreys.

Aclis supranitida, *S. Wood.*

"It has been collected at Bundoran by Mrs. Hancock"—Thompson (*sub Chemnitzia glabra*). Hyndman dredged dead shells occasionally in the vicinity of the Turbot Bank.

Aclis Gulsonæ, *Clark.*

In Turbot Bank sand, determined by Mr. Jeffreys—Hyndman (*Jeffreysia Gulsonæ*). Specimens from the Turbot Bank are in the Belfast Museum.

var. **tenuicula.** "Lough Strangford (Waller)"—Jeffreys.

Genus **Odostomia,** *Fleming.*

This, the largest and perhaps the most complicated genus of British shells, has by no means been worked out in our district. With the assistance of that eminent conchologist, Mr. Jeffreys, Hyndman was enabled to publish very full lists of the *Odostomiæ* of the Turbot Bank, and of the 34 British species, no less than 21 are recorded from this vicinity, all in a dead state; but beyond this, there is a paucity of information concerning them. Their minute shells are easily overlooked, and it is only with the aid of the microscope that the exquisite sculpture which characterises many of the species, may be seen with advantage. In the absence of records of any of the following species having been taken alive, I have omitted noting "dead" after each station.

Odostomia nivosa, *Montagu.*

"Turbot Bank sand Mr. Jeffreys"—Hyndman (*sub O. cylindrica*).

Odostomia truncatula, *Jeffreys.*

A single specimen found among Turbot Bank sand by Mr. Jeffreys; and later it was dredged in 25 fathoms off Black Head—Hyndman; specimens from thence are in the Belfast Museum. It is a very rare species, and its other British stations are all on the South of England coasts.

Odostomia Lukisi, *Jeffreys.*

"Bundoran, Co. Donegal, in drift shell sand (Waller)"—Jeffreys.

Odostomia rissoides, *Hanley.*

Found by Jeffreys in Turbot Bank sand—Hyndman. Bundoran—Belf. Mus. Coll. It is a littoral species, and is distributed throughout the British coasts.

var. **alba.** Turbot Bank, Mr. Waller—Hyndman (*sub O. alba*).

var. **nitida.** Found by Jeffreys in Turbot Bank sand—Hyndman (*sub O. nitida*).

var. **dubia.** As last (*sub O. dubia*).

Odostomia pallida, *Montagu.*

"A very few individuals of this species have been dredged in Belfast Bay, and taken in the stomach of the grey mullet captured there; under stones between tide marks. Strangford Lough, on soft sand and ooze"—Thompson. Dredged in the vicinity of the Turbot Bank on several occasions—Hyndman (*sub O. eulimoides*). In shell sand dredged near Ardmillan in Strangford Lough—R.Ll.P. It is one of the commoner *Odostomiæ*, and lives on the ears of *Pecten opercularis* and *P. maximus*, in the coralline zone; the littoral habitat assigned above by Thompson for the species, casts some doubt on the correctness of his determination.

Odostomia acuta, *Jeffreys.*

From the Turbot Bank; determined by Mr. Alder—Hyndman.

Odostomia conspicua, *Alder.*

As last; like it, it is an inhabitant of the coralline zone (15-50 fathoms).

Odostomia unidentata, *Montagu.*

"More frequent in the shell sand that has come under my notice than any other species of *Odostomia*"—Thompson; he mentions Strangford Lough as a locality. Hyndman took it several times on the Turbot Bank, and Dickie off the entrance to Strangford Lough. Twin Islands in Belfast Harbour—Mr. Swanston.

Odostomia turrita, *Hanley.*

Turbot Bank, Mr. Waller—Hyndman (*sub O. unidentata* var. *turrita*).

Odostomia plicata, *Montagu.*

"It has been found in Belfast Bay and Strangford Lough by Mr. Hyndman and myself; at Bundoran by Mrs. Hancock"—Thompson. Rare, off Bangor, and on the Turbot Bank—Hyndman. Jeffreys gives no northern stations for the present species, and says that *O. turrita* has been often mistaken for it.

Odostomia insculpta, *Montagu.*

Observed by Jeffreys in Turbot Bank sand which was sent to him for examination—Hyndman.

Odostomia obliqua, *Alder.*

"Two specimens obtained from shell sand collected at Bundoran by Mrs. Hancock"—Thompson.

Odostomia Warreni, *Thompson.*

"A specimen from Bundoran, Mrs. Hancock"—Thompson (*sub Rissoa Warrenii*). Turbot Bank, Mr. Waller—Hyndman. In the body of Jeffreys' "British Conchology" it appears as *O. obliqua* var. *Warreni*, but in the Supplement to that work it is restored to the rank of a species. It was first described by Mr. Thompson in the "Annals of Natural History," from specimens found at Portmarnock by Mr. T. W. Warren, an assiduous Irish conchologist, in whose honour Mr. Thompson named it as above.

Odostomia decussata, *Montagu.*

This beautiful little shell has been found in Turbot Bank sand by Mr. Jeffreys. Specimens labelled "Co. Antrim" are in the Belfast Museum Collection.

Odostomia indistincta, *Montagu.*

Bundoran, Mrs. Hancock—Thompson. On the Turbot Bank on several occasions—Hyndman. In Strangford Lough and the channel adjoining, very rare—Dickie. (All *sub Chemnitzia indistincta*).

Odostomia interstincta, *Montagu.*

It would appear to be of common occurrence in the Turbot bank shell sand (*Chemnitzia interstincta*), but is not noted elsewhere. A widely distributed and common species generally.

Odostomia spiralis, *Montagu.*

"Very sparingly, in shell sand collected at Magilligan by Miss Moody"—Thompson. Common on the Turbot Bank—Hyndman. Entrance to Strangford Lough, 12-15 fathoms, very rare—Dickie.

Odostomia excavata, *Philippi.*

"Bundoran, Mr. Warren"—Thompson (*sub Rissoa Harveyi*). Turbot Bank, Mr. Waller—Hyndman. Mr. Thompson named it *R. Harveyi* in honour of Dr. W. H. Harvey, who discovered the first British examples, in Co. Clare; Dr. Harvey had previously named it *Cingula sculpta*. Both these proved to be subsequent to Philippi's name of *R. excavata*.

Odostomia scalaris, *Philippi.*

Found in Turbot Bank sand by Mr. Jeffreys—Hyndman (*Chemnitzia scalaris*). Dickie records it from Strangford Lough, but from a remark in Jeffreys' work, it would appear that it was the following variety which he obtained there.

var. **rufescens.** Rare, off Groomsport (Waller); and dredged on the Turbot

Bank—Hyndman (*sub Chemnitzia rufescens*). "Lough Strangford (Dickie)" —Jeffreys.

Odostomia rufa, *Philippi.*

var. **fulvocincta.** Turbot Bank, rare; determined by Mr. Alder—Hyndman (*Chemnitzia fulvocincta*). Bundoran—Belf. Mus. Coll. The *Chemnitzia rufa* of Hyndman's 1858 Report, in Jeffreys' list of Turbot Bank shells, in all probability belongs to the variety; the typical form is exclusively southern, while the variety has a northern distribution.

Odostomia lactea, *Linné.*

Not uncommon—Thompson. Dredged frequently around the Turbot Bank by Hyndman, and in Strangford Lough and the open channel adjacent by Dickie (all *sub Chemnitzia elegantissima*). Twin Islands in Belfast Harbour—Mr. Swanston. Bundoran—Belf. Mus. Coll. It is a common but beautiful species, inhabiting the laminarian zone.

Odostomia Scillæ, *Scacchi.*

Both Waller and Hyndman dredged this shell on the Turbot Bank (*Eulimella Scillæ*). Jeffreys, referring to this station, says "perhaps from a post-glacial deposit." Specimens from the Turbot Bank are in the Belfast Museum, and look quite as recent as the majority of the shells from that vicinity.

Odostomia acicula, *Philippi.*

Found in Turbot Bank sand by Mr. Jeffreys—Hyndman (*sub Eulimella acicula*). The collection in the Belfast Museum contains specimens from that locality.

var. **ventricosa.** Turbot Bank, Mr. Waller—Hyndman (*sub Eulimella affinis*).

var. **obeliscus.** "Dredged by Mr. Waller on the north-east coast of Ireland" —Jeffreys. Possibly this and the previous note refer to the same specimens.

Odostomia nitidissima, *Montagu.*

"Specimens from Bundoran have come under my inspection"—Thompson (*Chemnitzia nitidissima*).

Ianthina rotundata, *Leach.*

This beautiful oceanic species, popularly known as the "blue snail," is occasionally wafted to our shores by the western winds, during the autumn months. Thompson mentions having obtained a few shells, still containing the animal, on the beach at Groomsport in Co. Down, in the year 1836 (*sub I. communis*), but it is very rarely that it is found so far south in the channel. On the north coast of Antrim, and on the coast of Derry, it is of more frequent occurrence, and is occasionally washed in in quantity. I am informed that after October gales the strand at Bush-foot is sometimes thickly strewn with it. Portrush, occasionally—Miss Richardson, and R.Ll.P.

Eulima polita, *Linné.*

About the entrance of Belfast Bay (Ordnance Survey Collectors and Mr. Hyndman), and in Strangford Lough (Mr. Hyndman and W. T.), bottom

pure sand in each case—Thompson. Hyndman records dead shells only, which appear to be of frequent occurrence in the neighbourhood of the Turbot Bank. Dickie dredged a few living examples off the entrance to Strangford Lough, in 12-15 fathoms, and dead specimens inside the lough. Off Bangor, in 8 fathoms, living—Mr. Swanston.

Eulima distorta, *Deshayes.*

Bundoran, Mrs. Hancock—Thompson. Dead shells are not unfrequent on the Turbot Bank, according to Hyndman.

var. **gracilis.** Dredged by Hyndman on the Turbot Bank, and by Dickie in 12-15 fathoms outside Strangford Lough.

[Eulima subulata, *Donovan.*

Stated by Thompson to have been obtained at Bundoran, Co. Donegal, and Dundrum, Co. Down, but there is no doubt that *E. bilineata* is the species intended.]

Eulima bilineata, *Alder.*

"Dredged from a sandy bottom, 8-10 fathoms, off Dundrum, Co. Down, Mr. Hyndman and W.T.; a specimen at Bundoran, Mr. Warren"—Thompson (*sub E. subulata*). Dead shells are common on the Turbot Bank—Hyndman. Living, very rare, in 7-20 fathoms, in Strangford Lough, and dead in the channel adjoining—Dickie.

Natica Islandica, *Gmelin.*

Dead; a single young specimen by Mr. Jeffreys"—Hyndman, 1859 Report (*sub N. helicoides*). The locality is not given, but was probably the Turbot Bank. This specimen may have been a quaternary fossil. It is a northern species, which in Britain is taken chiefly on the northeast coasts, though it has been found at Cork. It is widely distributed in post-glacial beds.

[N. Grœnlandica, *Beck.*

A shell from the Turbot Bank is in Thompson's collection in the Belfast Museum. Any specimens occurring there are not recent, but relics of the glacial epoch; Jeffreys records it also as dredged on the Turbot Bank, and enters it as a fossil. Its present habitat in Britain is limited to rather deep water off the northeast coasts of England and Scotland.]

Natica sordida, *Philippi.*

Strangford Lough and the channel adjoining are the only localities in which this species has been obtained in the North of Ireland. Here Dickie dredged it on several occasions, but only in a dead state, in depths varying from 10 to 25 fathoms; specimens from the same locality are in Thompson's collection in the Belfast Museum.

Natica catena, *Da Costa.*

One of our commoner shells, living chiefly in sandy bays at a few fathoms depth. "Living, common, 6-8 fathoms, from Bangor to Donaghadee"—Mr. S. A. Stewart. Thrown up alive, and of large size, on Magilligan Strand,

Co. Derry—R.Ll.P. Dead shells were dredged in some abundance around Belfast and Strangford Loughs by Hyndman and Dickie, in from 15 to 30 fathoms (*N. monilifera*).

Natica Alderi, *Forbes.*

This very pretty shell is common, living at nearly all depths (4 to 90 fathoms) throughout the waters dredged by Hyndman and Dickie (*N. nitida*), and thrown up on sandy beaches throughout the province.

Natica Montacuti, *Forbes.*

Thompson records a living specimen dredged in Belfast Bay. Hyndman took it alive off Larne, at different depths up to 90 fathoms, and dredged dead shells in abundance around the entrance to Belfast Lough, in 15 to 30 fathoms (*sub N. Montagui*). It did not occur in any of Dickie's dredgings.

[Natica clausa, *Broderip & Sowerby.*

Dredged by Hyndman and Jeffreys on the Turbot Bank. It is a glacial fossil, and now inhabits the circumpolar seas alone.]

Adeorbis subcarinatus, *Montagu.*

Dredged up from the Turbot Bank by Hyndman, in a dead state, on several occasions; it is a southern shell, and has not been found elsewhere in our district.

Lamellaria perspicua, *Linné.*

"Generally distributed"—Thompson (*Sigaretus perspicuus*). Rare, living on *Laminaria*, and dredged alive in the unusual depth of 80 fathoms north of the Maidens, and dead in 15-25 fathoms off Ballygalley Head—Hyndman. Very rare, dead, in 15-25 fathoms off the entrance to Strangford Lough—Dickie. *Sigaretus tentaculatus*, recorded by Thompson as dredged by Mr. Hyndman and himself in Strangford Lough, is the male of the present species; the typical form is the female.

Velutina lævigata, *Pennant.*

A species of frequent occurrence, living on hard ground at all depths. Hyndman took it alive in 12 to 20 fathoms off Belfast Lough, and in 70-90 fathoms near the Maidens; and in a dead state on the Turbot Bank. Dead, rare, in 6 to 8 fathoms, off Bangor—Mr. S. A. Stewart. It did not occur in Dickie's dredgings, probably owing to the muddy nature of the bottom in Strangford Lough. Thrown up by the tide at Newcastle, Portrush, and Magilligan—R.Ll.P.

var. **candida.** Jeffreys found this white variety on the coast of Antrim.

Trichotropsis borealis, *Broderip & Sowerby.*

In Hyndman's Reports for 1857 and 1858, this species is noted as occurring in a dead state in almost every haul of the dredge made around the entrance to Belfast Lough, and on the Turbot Bank especially; in the 1859 Report he records having obtained it alive in the latter place. Dead shells also occurred to him in the deepest water at the Maidens. Dickie dredged a

single dead specimen in 12-15 fathoms off the entrance to Strangford Lough.

Aporrhais pes-pelecani, *Linné.*

A well-known and common species, locally called "leg-of-mutton shell." It lives in about 10 to 25 fathoms, but is sometimes taken at both less and greater depths.

[Cerithium metula, *Lovén.*

In dredged sand from the Turbot Bank—Hyndman, 1859 Report. Erroneously recorded from the same vicinity in the 1857 Report; *Cerithiopsis pulchella* was the species intended. It is a northern form, and its only British station is the Shetland fishing-banks, where it lives in 45-96 fathoms (Jeffreys); the Turbot Bank specimens are manifestly fossil.]

Cerithium reticulatum, *Da Costa.*

Very common, living between tide-marks and to a few fathoms depth, everywhere. In a dead state it is common on the Turbot Bank.

Cerithium perversum, *Linné.*

"In shell sand, mouth of Belfast Bay, Mr. Hyndman"—Thompson (*sub Triphoris adversus*). Not uncommon in Turbot Bank sand—Hyndman; very rare, in 12-15 fathoms, off the entrance to Strangford Lough—Dickie (*sub C. adversum*); in all instances dead. Specimens labelled "Bundoran" are in the Belfast Museum Collection.

ORDER SIPHONOBRANCHIATA.

Cerithiopsis tuberculariS, *Montagu.*

"Sandy beach at Magilligan; and in stomach of Scaup duck shot in Belfast Bay"—Thompson (*sub Cerithium tuberculare*). Hyndman several times dredged dead shells on the Turbot Bank.

Cerithiopsis pulchella, *Jeffreys.*

Found by Mr. Waller in Turbot Bank sand—Hyndman. It is a rare species.

[Cerithiopsis costulata, *Möller.*

Another of the Turbot Bank fossils; it was dredged there by Waller and Hyndman (*sub Skenea costulata* and *Cerithium niveum*) and specimens from thence are in the Belfast Museum. It inhabits the northern seas, and Shetland appears to be its most southern station.]

Purpura lapillus, *Linné.*

Very common, on rocks and stones, between tide-marks. Locally called "white wilk," or "dog wilk." Dead shells occur on the Turbot Bank.

Buccinum undatum, *Linné.*

The common whelk, or "buckie," as it is locally called, is abundant

on all kinds of ground and at all depths, from half-tide down to 100 fathoms, the limit of the British fauna.

var. **littoralis.** Carrickfergus—Belf. Mus. Coll. It is probably common.

var. **striata.** Living in 60 fathoms about 6 miles from the Maidens—Hyndman.

[Buccinum cyaneum.

"A fragment only, considered by Mr. Jeffreys to be this species, in Turbot Bank sand, Mr. Waller"—Hyndman, 1858 Report. I have failed to trace this species to a modern synonym; it is probably some glacial fossil.]

Murex erinaceus, *Linné.*

"Of general occurrence"—Thompson (*Triton erinaceus*). Jeffreys, after giving a list of British stations, remarks "all the specimens procured from the northern coasts were dead;" and this remark applies to our province, for, though it is of frequent occurrence on the shore, and in depths up to 30 fathoms, I find no note of its having been taken alive.*

Trophon muricatus, *Montagu.*

Hyndman dredged it alive on the Cod Bank off Larne (20 fathoms), and also in 25 fathoms off Black Head, but very sparingly; and took it rather commonly in a dead state off Donaghadee, and on the Turbot Bank, and in 70-100 fathoms near the Maidens. From Dickie's Report, dead shells appear to be distributed throughout Strangford Lough and the channel adjacent. Jeffreys queries these and other northern records, and considers that they are probably referable to *T. Barvicensis.* The present species has its head-quarters in Lusitanian and Mediterranean waters, and does not range north of Britain.

Trophon Barvicensis, *Johnston.*

Hyndman obtained it living with the last in the two stations mentioned, and dead in 8-10 fathoms in Belfast Lough, and on the Turbot Bank. Dickie dredged a few dead specimens in 12-15 fathoms outside Strangford Lough. This is a northern form, ranging to the arctic seas, and not found south of Britain.

Trophon truncatus, *Ström.*

"On all parts of the Irish coast"—Thompson (*sub Fusus Bamffius*). Living in from 6 to 25 fathoms around Belfast Lough, and in much deeper water (70-90 fathoms) off the Maidens, and common in a dead state in from 12 to 100 fathoms—Hyndman. Very rare, dead, in Strangford Lough and the channel adjoining—Dickie. (Both *sub T. clathratus.*)

[Fusus scalariformis, recorded by Hyndman as found in Turbot Bank sand by Mr. Jeffreys, is *Trophon clathratus,* a characteristic fossil of all glacial and post-glacial beds.]

[Fusus decussatus of Brown (Illust. Conch. G. B.) is said to have been discovered by him at Killough, Co. Down. The figures and description are

* Since above went to press, the writer has dredged it alive in 3 fathoms off Rockport, Belfast Lough.

not sufficient for identification. Jeffreys suggests that it may have been a plain-coloured variety of *Trophon Syracusanus*, which is a rather common Mediterranean shell.]

Fusus antiquus, *Linné.*

Living commonly around the coast, ranging in depth from between tide-marks in Belfast Lough to 100 fathoms at the Maiden Rocks. Called "buckie" along with *Buccinum undatum*. Specimens of great size from Carrickfergus are in the Belfast Museum Collection. A curious convoluted monstrosity is mentioned by Hyndman as dredged off Groomsport by Mr. Samuel Vance.

var. **alba.** Carrickfergus—Belf. Mus. Coll.

Fusus gracilis, *Da Costa.*

Frequent, but not so generally distributed as the last. Hyndman dredged it alive in 60 to 90 fathoms off the Maidens (*F. Islandicus*). Jeffreys gives its range as 20 to 145 fathoms, but it frequents less depths in our district, as it has been dredged living in abundance in 6-8 fathoms off Bangor by Mr. S. A. Stewart, and is sometimes thrown ashore in quantity, with the animal quite fresh, between Holywood and Craigavad, where the greatest depth of water in the vicinity does not exceed 4 or 5 fathoms, and the writer has noticed it living between tide-marks at Cultra. It did not occur to Dickie in Strangford Lough, nor have I observed it on the Derry coast. It is *F. corneus* of Thompson's work.

Nassa reticulata, *Linné.*

Would appear to be somewhat local. Occasionally found living about Belfast Lough, in 10 to 20 fathoms; dead on the Turbot Bank—Hyndman. Living between tide-marks at Cultra—R.Ll.P. Not recorded from Strangford Lough. I have dead shells from Portrush and Magilligan.

Nassa incrassata, *Ström.*

Abundant throughout the province, living in from 7 to 90 fathoms. *N. macula* of Thompson's work.

Nassa pygmæa, *Lamarck.*

Very rare. In Hyndman's 1858 Report it is noted as having been taken alive by Mr. Waller on the Turbot Bank; in the previous Report it had been recorded with doubt from the same vicinity, by Dr. Dickie, but only in a dead state. It is a common shell in our Estuarine Clays, where *N. incrassata* is unknown.

[Nassa hepatica, *Montagu.*

Recorded from Strangford Lough, on the authority of Turton and Brown (*Monoceros hepaticus*). It is a West Indian shell.]

[Columbella Holbolli.

Appears in Hyndman's Reports for 1857 and 1858 (*sub Mangelia Holbolii* and *Buccinum Holbolii*) as dredged on the Turbot Bank. It is an inhabitant of the arctic seas, and occurs in Britain only as a glacial fossil.]

Defrancia teres, *Forbes.*

Fragments of this shell were dredged by Hyndman on the Turbot Bank.

Defrancia Leufroyi, *Michaud.*

Dead, but very fresh, in Turbot Bank sand, and a single broken example in 40 fathoms off the Copelands—Hyndman (*Mangelia Leufroyi*).

Defrancia linearis, *Montagu.*

"Generally distributed"—Thompson (*Pleurotoma linearis*). Frequent on the Turbot Bank—Hyndman; rare in Strangford Lough and the channel adjoining—Dickie; in all instances dead (*sub Mangelia linearis*).

Defrancia reticulata, *Renier.*

"A single dead specimen of this rare and beautiful shell was found by Mr. Jeffreys in dredging from the deep water north of the Maidens. New to the Irish list. It is a southern form"—Hyndman, 1859 Report (*sub Mangelia reticulata*). As *Mangelia scabra*, it is recorded in Hyndman's 1858 Report as found by Mr. Jeffreys in Turbot Bank sand.

Defrancia purpurea, *Montagu.*

"Of general occurrence"—Thompson (*Pleurotoma purpurea*). "Rare, in shell sand"—Hyndman (*Mangelia purpurea*). Very rare, in 12-25 fathoms off the entrance to Strangford Lough—Dickie. Bangor—Belf. Mus. Coll. Shell sand on beach at Cultra—R.Ll.P.

Pleurotoma striolata, (*Scacchi*) *Philippi.*

Turbot Bank sand—Hyndman (*Mangelia striolata*).

Pleurotoma attenuata, *Montagu.*

"General, but not abundant"—Thompson. "Dead, Turbot Bank sand, Mr. Waller"—Hyndman (*Mangelia attenuata*). Very rare, dead, in 18-20 fathoms 4 to 5 miles from Strangford Bar—Dickie. Bundoran—Belf. Mus. Coll.

Pleurotoma costata, *Donovan.*

Dead, rare, in 10 fathoms, and not unfrequent on the Turbot Bank—Hyndman (*Mangelia costata*). Dickie dredged dead shells off the entrance to Strangford Lough, 12-15 fathoms. The variety *coarctata*, mentioned by Hyndman as obtained near the Turbot Bank, is merely the northern and larger form of the species.

Pleurotoma brachystoma, *Philippi.*

"Co. Antrim (Waller)"—Jeffreys; this is all the information we possess about the occurrence of this shell in the district.

Pleurotoma nebula, *Montagu.*

Dead, rare, in shell sand dredged on the Turbot Bank—Hyndman (*Mangelia nebula*).

Pleurotoma septangularis, *Montagu.*

"Generally distributed"—Thompson. Living, rare, in 10 fathoms in Belfast Lough, and dead on the Turbot Bank—Hyndman; and Dickie found a few living examples in Castle Ward Bay, Strangford Lough, 7-20 fathoms (both *sub Mangelia septangularis*). Bangor—Belf. Mus. Coll.

Pleurotoma rufa, *Montagu.*

Living, rare, off Groomsport (Waller), and dead on the Turbot Bank—Hyndman (*Mangelia rufa*). Dead shells in Strangford Lough—Thompson, Dickie, and R.Ll.P.; and in the channel outside—Dickie.

var. **lactea.** "A small form of this pretty variety, mostly having the upper part of the spire tinged with purplish-brown, was procured by Mr. Hyndman from Port Ballantrae, Co. Antrim"—Jeffreys.

var. **Ulideana.** "Round the Irish coasts, but rare"—Thompson (*sub P. Ulideana*).

Pleurotoma turricula, *Montagu.*

"Of general occurrence"—Thompson. Living in 25 fathoms off Black Head; dead, rare, on the Turbot Bank, and off Ballygalley Head, and frequent in 5-6 fathoms in Belfast Lough—Hyndman. Dead, rare, in Strangford Lough—Dickie (*Mangelia turricula*). Bangor—Belf. Mus. Coll. Crawfordsburn, dead—Mr. Swanston. Cultra, dead—R.Ll.P.

[**Pleurotoma Trevelyana,** *Turton.*

Dredged in 25 and 27 fathoms in the neighbourhood of the Turbot Bank—Hyndman (*Mangelia Trevelliana*). Jeffreys considers that the specimens there obtained were glacial fossils. The species is entirely northern.]

Marginella lævis, *Donovan.*

"Magilligan, Co. Londonderry, G. C. Hyndman"—Thompson (*sub Brato lævis*).

Cypræa Europæa, *Montagu.*

Generally diffused throughout our waters, living in from about 0 to 20 fathoms. In a dead state it is thrown up on most sandy beaches, and was dredged in up to 100 fathoms depth near the Maidens. The pretty and well-known shells of this, the only British cowry, are locally called "Johnny-grots," which is a corruption of the Scotch name of "John-o'-Groat's buckie." *Bulla diaphana*, recorded by Thompson as taken in Strangford Lough, is the young of the present species before the outer lip is formed.

[**Cypræa moneta.**

"Specimens of this shell have been frequently found on the shore near Bangor, Co. Down. Although not indigenous, its occurrence may be worth noticing, as there is a tradition that a ship engaged in the slave trade was wrecked there, and thus the cowries are accounted for"—Hyndman. It is the money-cowry of South Africa.]

Ovula patula, *Pennant.*

"A shell of this species, found some years ago on the sandy beach of Magilligan, County of Londonderry, by Mrs. R. A. Hyndman, of Dublin, is in the cabinet of Mr. Hyndman, at Belfast"—Thompson. A single dead specimen dredged by Mr. Waller on the Turbot Bank—Hyndman. These are the only notes of the occurrence of this curious shell in the North of Ireland. The Magilligan specimen is in the Belfast Museum.

ORDER PLEUROBRANCHIATA.

Cylichna acuminata, *Bruguière.*

Mr. Waller obtained a single dead shell of this species on the Turbot Bank, and Hyndman another. These are recorded in Hyndman's Reports, under the name *Ovula acuminata.*

Cylichna umbilicata, *Montagu.*

Very rare; dead shells in Turbot Bank sand—Hyndman.

Cylichna cylindracea, *Pennant.*

"Generally distributed"—Thompson (*sub Bulla cylindracea*). Dredged, in a dead state, on the Turbot Bank, and off Ballygalley Head, by Hyndman, and in Castle Ward Bay, Strangford Lough, by Dickie. Bundoran—Belf. Mus. Coll.

[Cylichna striata (*Bulla striata,* Brown).

"The late Mr. Thompson of Belfast erroneously noticed this arctic species as found at Bangor, Co. Down, by Mr. Hyndman. It inhabits the eastern coasts of North America, Greenland, and Finmark"—Jeffreys.]

Utriculus mammillatus, *Philippi.*

Turbot Bank, dead, Mr. Waller—Hyndman (*Cylichna mammillata*).

Utriculus truncatulus, *Bruguière.*

"Generally distributed"—Thompson (*Bulla truncata*). Hyndman occasionally dredged dead shells on the Turbot Bank (*Cylichna truncata*), but does not record having taken it elsewhere. Magilligan—Belf. Mus. Coll. Twin Islands in Belfast Harbour—Mr. Swanston.

Utriculus obtusus, *Montagu.*

"Generally distributed"—Thompson (*Bulla obtusa*). Hyndman notes it (*sub Cylichna obtusa*) from the Turbot Bank several times, and from off Ballygalley Head, in a dead state. Dead shells dredged in Strangford Lough—Dickie, and R.Ll.P. It frequents muddy estuaries chiefly.

var. **Lajonkaireana.** "From the Turbot Bank, dead; determined by Mr. Jeffreys, in Mr. Hyndman's cabinet"—Hyndman, 1859 Report (*sub Cylichna Lajonkaireana*).

Utriculus hyalinus, *Turton.*

"Obtained in shell sand collected at Bundoran by Mrs. Hancock"—Thompson (*sub Bulla hyalina*). "Dead, in 80 fathoms, off the Maidens"—Hyndman (*sub Amphisphyra hyalina*).

Acera bullata, *Müller.*

Generally distributed—Thompson (*sub Bulla Akera*). It abounds on the *Zostera* banks of Strangford, Belfast, and Larne Loughs, and in Lough Foyle. Hyndman says he has sometimes seen it swimming in the channel leading to the Quays at Belfast, giving out a purple liquid when touched.

var. **nana.** "Occurs in Larne Lough"—Jeffreys.

Actæon tornatilis, *Linné.*

Generally distributed—Thompson. Dead, rare, off Bangor, and on the Turbot Bank—Hyndman. Dead, rare, in Castle Ward Bay, Strangford Lough—Dickie. (*Sub Tornatella fasciata* by all.) Groomsport—Mr. Swanston. Dead, rare, 8-10 fathoms, Belfast Bay—Mr. S. A. Stewart. Port Stewart—Miss Richardson. Frequent on the Derry coast, thrown up by the tide, from the Bann to Magilligan Point—R.Ll.P. It is a most elegant shell. Rev. Canon Grainger informs me that at Magilligan it is locally known as "beer-barrel."

Bulla utriculus, *Brocchi.*

"Living, very rare. A single specimen from Groomsport many years ago; none since"—Hyndman; and in his first list of Turbot Bank shells he notes "a single dead specimen each to Dr. Dickie and G. C. H." (*sub B. Cranchii*).

Scaphander lignarius, *Linné.*

"Generally distributed"—Thompson (*sub Bulla Lignaria*). "Not uncommon, of large size, off Groomsport, living, in 6 or 8 fathoms, and in other places"—Hyndman; and he dredged dead shells in depths up to 100 fathoms. Living in abundance, and of large size, in 6 to 8 fathoms off Bangor, and from thence to Crawfordsburn—Mr. Swanston, and Mr. S. A. Stewart. Fine living examples dredged in 2 fathoms off Cultra, and it is occasionally thrown up by the tide between Holywood and Craigavad in quantity, with the animal fresh—R.Ll.P. Jeffreys states that it usually frequents the coral-line zone (15-50 fathoms); the above notes show that in our district it inhabits shallower water. Dead shells at Portrush and Magilligan—R.Ll.P.

var. **alba.** Bangor—Belf. Mus. Coll.

Philine scabra, *Müller.*

"Has been found at Bundoran (Co. Donegal), by Mrs. Hancock"—Thompson (*sub Bulla pectinata*). Rare, dead, on the Turbot Bank—Hyndman.

Philine catena, *Montagu.*

"Bundoran, Co. Donegal (J.G.J.)"—Jeffreys. Specimens from the same station are in Thompson's collection in the Belfast Museum.

Philine angulata, *Jeffreys.*

"Larne, Co. Antrim (J.G.J.)"—Jeffreys.

Philine quadrata, *Searles Wood.*

"Dead, in 80 fathoms off the Maidens"—Hyndman, 1859 Report.

Philine punctata, *Clark.*

Bundoran in Co. Donegal, where it has been obtained by Mrs. Hancock (*fide* Thompson, *sub Bullæa punctata*), and Jeffreys.

Philine aperta, *Linné.*

"Generally distributed"—Thompson (*Bullæa aperta*). A rather common species, living in sand and mud at a few fathoms depth. "Living, common,

6-8 fathoms off Bangor"—Mr. S. A. Stewart. Of large size on the Holywood Banks—Mr. Swanston. Dead shells on Magilligan strand—R.Ll.P.

Aplysia punctata, *Cuvier.*

"Living, rather scarce, in 8 or 10 fathoms, off Bangor and Groomsport, and in Castle Chichester Bay"—Hyndman (*sub A. hybrida*). *A. nexa* of Thompson is the young of this species.

Pleurobranchus membranaceus, *Montagu.*

"Living, scarce, off Groomsport, in 6 or 8 fathoms, and in other places"—Hyndman.

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Names of shells which are not admitted as native, owing to their being importations, mistakes, or fossils, or which appear in the foregoing list only as synonyms, are printed, in the case of *genera*, in parenthesis, and in the case of *species*, in italics.

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PROCEEDINGS

OF THE

Belfast Naturalists' Field Club.

APPENDICES, VOL. II., NO. 4.

1893-4.

LEPIDOPTERA

TAKEN IN THE BELFAST DISTRICT.

By CHARLES W. WATTS, F.I.C.

LEPIDOPTERA

TAKEN IN THE BELFAST DISTRICT.

By Charles W. Watts, F.I.C.

INTRODUCTION.

[*Read 20th February, 1894.*]

The entomologist living in Belfast has within his reach many places where he can capture his game. For short excursions, the range of hills from the Knockagh to the White Mountain is probably the best ground, including, as it does, wooded glens such as Collin Glen, the chalky slopes of the eastern faces, and the moorland and bogs of the higher parts of the hills. Each of these has its characteristic flora, and, feeding on the plants, we may expect an insect-fauna to correspond.

Nearer home than the hills are productive spots like the marshes by the Lagan, and the Bog Meadows, and the lanes and hedgerows produce plenty of common insects, besides some better species among the Micro-lepidoptera.

Further afield, but still within a day's excursion, are Islandmagee and the coast just north of Larne, and on the Co. Down side, the shore and the numerous plantations, especially the woods about Helen's Tower.

Inland in both counties we cannot expect great results. The country is more or less cultivated, and on such ground only the commonest species occur, but these sometimes swarm in particular places.

Of the more distant localities within the district the Mourne Mountains are undoubtedly the best, and after them, the Glens of Antrim, particularly Glenarm, and the sandhills of Portrush,

Ballycastle, and Dundrum. I have no experience of the Antrim hills north of Larne, but they are so similar to the Belfast hills that their fauna is probably very much the same.

I will now proceed to describe some of these localities more particularly, and mention some of the insects that occur in each. It will, of course, be understood that I do not imply that these are the only, or the best places for collecting, but that they are the places with which I happen to be familiar, either because they were convenient to the part of the town where I lived, or because they were favourite places for holiday-making.

About a quarter of a mile north of the second lock on the Lagan there are some low-lying marshy fields. To the N. and E. the ground rises pretty steeply, and in the N.E. corner is a pond. Along the side of the slope is a disused water-course, which formerly, I believe, supplied the town. It is now filled with water-plants, *Sparganium*, *Iris*, and various reeds and grasses. When in flower in June and July these reeds attract numbers of *Noctuæ*, the larvæ of which feed on the leaves in the autumn and spring. The most abundant species are *Leucania pallens*, *impura*, *comma* and *lithargyria*; *Tapinostola fulva*, *Noctua umbrosa*, *baja*, *c-nigrum*, *festiva*, *rubi*, and *xanthographa*, *Apamea leucostigma* and *didyma*, the last in great numbers and infinite variety of colour and markings.

Earlier in the season several species of the genus *Tæniocampa* may be found feeding at the blossom of the willow at night. Flying over nettles and flowers in the summer, we may net *Plusia pulchrina*, *chrysitis* and *festucæ*, *Dianthœcia nana* and *capsincola*, whose larvæ feed in the seed capsules of *Silene* and *Lychnis*. To capture these *Noctuæ* in the summer months, the collector must keep late hours, for they do not settle down to feed till it is really dark, and in these latitudes that is not before half-past ten. From this time until midnight they can be taken off grass and reed flowers by the simple process of enclosing them in a chip-box after examining by the light of a lantern to see whether they are worth taking. They seldom attempt to fly; at the most, they sometimes drop to the ground or into

the water, as the case may be, for the grasses actually growing in the old water-course are by far the most attractive. The collector must be prepared to get his feet wet, or lose most of his moths. The only scarce Geometer that occurs in the marshes is *Phibalapteryx vittata*. The larva of this moth feeds on *Galium palustre*, and the moth is extremely abundant in June, both in these marshes and in the Bog Meadows. It is usually a scarce species in Ireland, so that it may fairly be claimed as a local speciality.

Along the rough hedge at the top of the hill we may capture a number of species, mostly common, but *Emmelesia decolorata* is a good thing, which is abundant here. Only the commonest butterflies can be expected in such a locality, and it is hardly worth visiting in the day-time, except for Micro-lepidoptera, of which a number of common species occur. On the banks of the river I have found the curious larva of the *Chærocampa elpenor* (Elephant Hawk) feeding on *Epilobium hirsutum*, and the larva of *Smerinthus populi* is common on the willows. *Epione apiciaria* also feeds on the willows along the river, and the moth, which is scarce in Ireland, may be netted while flying at dusk in August. *Cataclysta lemnata* feeds on *Lemna* in the pond and ditches, and *Hydrocampa stagnata* on *Potamogeton* in the pond. Several species of the genus *Scopula* are common, and a number of *Tortrices* and *Tineæ*, but nothing rare has turned up here. Altogether, I have taken 103 species of butterflies and the large moths in this one field, besides Micro-lepidoptera.

Collin Glen is one of the best collecting grounds in the immediate neighbourhood of Belfast. It is at its best in May and June. Later in the year the vegetation gets so rank that it is difficult to collect in the upper glen, which is the best part. The fauna of the upper and lower glens differs considerably, as might be expected from the different character of the ground. In the lower glen the trees are larger and the ground more open, but on the whole the results of collecting, either by day or night, are disappointing. I have tried here the well-known

method of spreading what is called "sugar" on the trees to attract *Noctuæ*, but it has never proved a success. Indeed, the same may be said of every place that I have tried, except the Donard demesne at Newcastle. The cause is probably the dampness of the majority of the otherwise suitable localities, including most of the wooded glens in the district. Two of the less universal butterflies occur here, namely, *Pararge egeria* (Wood Argus) and *Epinephele hyperanthus* (Ringlet), the former being very common. *Euchloë cardamines* (Orange-tip) is also common in the glen, and still more so on the mountain just above, where I have taken specimens of a dwarf race. *Macroglossa bombyliformis* is common at the top of the glen; the larva feeds on *Scabiosa succisa*, and the moth is fond of the flowers of *Pedicularis*. Of the *Bombyces*, *Spilosoma fuliginosa* is common, also *Lophopteryx camelina* and *Thyatira derasa* and *batis*. The *Noctuæ* include *Miana arcuosa*, *Grammesia trigrammica*, *Dianthœcia nana*, and *Plusia pulchrina*, and of the *Geometræ*, which are more abundant, the commonest are *Metrocampa margaritaria* (Light Emerald), *Selenia bilunaria*, *Odontopera bidentata*, *Cabera pusaria* and *exanthemaria*, which fly in swarms about dusk, *Strenia clathrata*, *Eupithecia lariciata* among the larches in the higher parts, *Hypsipetes impluviata* among alder, *Melanthia bicolorata* and *ocellata*, *Anticlea badiata* and *nigrofasciaria* and *Cidaria silaceata*, of which the larva feeds on the enchanter's nightshade.

We are on very different ground when we come to explore the hills, and we meet with an entirely different insect fauna. Species which are universal on the lower ground are entirely absent on the heather, and naturally the heath-feeding species do not occur away from the food-plant. Besides the heath species there are several which feed on *Vaccinium*, on various low plants, on ferns and grasses, and on *Salix repens*. The last is comparatively scarce on most parts of the Belfast hills, so that the fauna is poorer than it would be if this favourite food-plant were more abundant. On the steep eastern face of the hills many plants grow which are not to be found off the Chalk,

and this peculiar flora results in a peculiar fauna, many species, particularly among the micros, occurring here, and nowhere else in the district except on similar ground along the Antrim coast.

There are no butterflies peculiar to the hills, but *Lycæna icarus* (Common Blue) and *Polyommatus phlæas* (Copper) are common on the Chalk. *Cœnonympha pamphilus* is to be found all over the hills, and *Euchloë cardamines* wherever *Cardamine pratensis* grows.

Of *Sphinges*, *Macroglossa bombyliformis* is common, and *Zygæna filipendulæ* on the east of Black Hill.

Of the *Bombyces*, *Nemeophila plantaginis* is rather scarce, but *Saturnia pavonia* (Emperor) is common. The larvæ of this moth, and of *Bombyx rubi* are to be found feeding on heath in the autumn, and the curious cocoon of the Emperor is a familiar object in winter.

Several good *Noctuæ* occur, and *Celæna Haworthii*, *Stilbia anomala*, *Noctua glareosa* and *festiva*, *Agrotis strigula*, and *Hadena glauca* and *adusta* are all fairly common. Some good varieties of commoner species also occur on the higher ground, *Triphæna comes* and *Noctua xanthographa* being especially remarkable. Of the *Geometræ* may be mentioned *Ematurga atomaria*, *Oparabia filigrammaria*, *Larentia cæsiata* and *salicata*, *Eupithecia satyrata*, var. *callunaria*, *E. nanata*, *Phibalaptervx lapidata* in marshy places, *Cidaria populata*, *C. testata*, and *Anaitis plagiata* among *Hypericum* on the east side of Black Mountain.

Two species of Plume moths are common on Black Hill, viz., *Mimæoptilus bipunctidactylus* and *pterodactylus*, and last autumn I took a specimen of the very rare *Platyptilia isodactyla* on marshy ground between Divis and Black Hill, where its food-plant grows abundantly.

A number of characteristic *Tortrices* occur, principally among heather. Of these the following are worth mention :— *Tortrix viburnana*, *T. palleana*, *Peronea caledoniana*, *Mixodia Schulziana*, *Catoptria hypericana*, *Eupœcilia ciliella*, *Argyrolepia Hartmanniana* and *Xanthosetia zœgana*.

The Knockagh near Carrickfergus is of a similar character, but there are several insects to be found there which do not seem to occur either on the Belfast hills or on Islandmagee. *Lycœna minima* (Little Blue) occurs about the top of the cliff, this being also the favourite ground for several good species, such as *Melanippe tristata*, *Nemeophilia plantaginis*, *Ennychia cingulata*, *Oxyptilus parvidactylus*, and *Scoparia ingratella*, most of which seem peculiar to this hill, at least so far as our district is concerned.

The cliffs and slopes of Islandmagee between Black Head and Gobbin Head are very productive. The morning is the best time here, for in the afternoon the sun soon gets behind the hill and the temperature falls rapidly. Of the night-flying insects I know nothing, as the locality is too far for walking back after work, and there is no late train to town.

Lycœna minima is exceedingly abundant here in June, and may be seen wherever *Anthyllis vulneraria* grows. The tiny larva feeds in the woolly flower-heads of this plant, but is very difficult to find. *Lycœna icarus* is common, also *Pararge megæra*, *Vanessa urticæ*, *atalanta*, and *cardui*.

Nemeophila plantaginis is commoner here than anywhere else in the district and in some years is exceedingly abundant. *Spilosoma fuliginosa* occurs, and the larvæ of *Bombyx quercus*, var. *callunæ* may be collected in June, feeding on bramble.

Of the other families of Lepidoptera may be mentioned *Strenia clathrata*, *Emmelesia albulata*, and *Eupithecia constrictata* among the *Geometræ*; *Scopula ferrugalis*, *Aciptilia tetradactyla*, *Homeosoma senecionis*, and *Phycis subornatella* among the *Pyralides*; and *Peronea Schalleriana*, *Penthina gentiana*, *Sericoris littoralis*, and *Conchylis straminea* among the *Tortrices*.

Plutella cruciferarum (the Diamond-back Moth), which has sometimes completely destroyed the crops of turnips and other cruciferous plants in England, is fairly common here, but I have never seen any sign of damage, so it may be hoped that the climate is unfavourable to its multiplication.

Glyphipteryx equitella and *Fischeriella*, tiny black and silver species, are to be found on grass, flying about 4 P.M. in the sunshine ; several species of *Argyresthesia* and *Elachista* are also to be found. In all probability much the same species occur at many similar spots along the Antrim coast, and a number of species are recorded from Glenarm, but these places are beyond a single day's excursion. At Glenariffe I have taken *Larentia olivata*, which is rare in Ireland, and no doubt the locality would repay investigation, though it is not well suited for night work.

On the north coast of Antrim, the sandhills of Ballycastle and Portrush are splendid collecting grounds for those species that frequent such places. At Ballycastle the very local *Nyssia zonaria* is plentiful at the beginning of April. So far this species is only recorded, in Ireland, from Ballycastle and Achill Island. It occurs also in the Isle of Man and on the coasts of Cheshire and North Wales.

I now come to the districts in County Down, and shall confine my remarks to the Mourne Mountains, and more particularly to the immediate neighbourhood of Newcastle, which is the best centre for collecting.

To the west of Newcastle there is a fine stretch of sandhills stretching to Dundrum Bay ; at the back of the village are the woods of Donard demesne, perhaps the best woods in our district, and beyond the woods are the mountains. Each of these produces its special insects, which, for the most part, are not to be found in the others. The best part of the sandhills begins about two miles from Newcastle and extends to Dundrum Bay ; they are continued on the opposite side of the bay, but this part is too distant for convenient working.

Two butterflies are abundant all over the sandhills, *Lycæna icarus* and *Satyrus semele* (Grayling). The western Irish forms of both differ considerably from the English and European types, being in both cases larger and more brightly coloured. In the south of England the male *icarus* is small and of a rather dull lilac-blue, and the female is brown, slightly tinged with

blue, and with a border of red spots round all the wings. In this district the male is large and very bright blue, approaching the colour of *Lycæna adonis*, while the female is also blue, though not so bright, and the marginal red spots are very large and bright. Specimens of both forms may be seen in the Museum collection.

There is not much to be got on sandhills early in the year; the real work begins with the flowering of the marram grass in June and July, and is better still when the ragweed is in flower in August. Great numbers of *Agrotidæ* and other *Noctuæ* frequent these flowers. A few come out about 4 P.M. on sunny days, and are then easily collected; but for one that is out then a hundred are out after dark.

The heads of the *Senecio* are sometimes very large in such situations, and on a single flower-head I have counted fifty or sixty moths at once; but they are very particular in their choice, and while one flower-head is nearly covered with moths, neighbouring and, as far as we can see, exactly similar heads are nearly deserted. Besides the moths there are plenty of earwigs, beetles, and gnats for any that are interested in these orders of insects. A few species are particularly abundant, viz.:—*Apamea didyma* in infinite variety, *Agrotis tritici* and *Noctua xanthographa*, also very variable. Five out of six moths belong to one or other of these species, but several others are also common—*Miana strigilis*, *M. bicoloria*, *M. literosa*, *Agrotis vestigialis*, *A. cursoria*, *A. nigricans*, *A. præcox*, *A. lucernea*, and *A. suffusa*; *Noctua rubi*, *Triphæna ianthina*, and the common yellow underwings; *Phlogophora meticulosa*, *Hydræcia lucens*, *H. micacea*, and a number of others. A few *Geometræ* come also to the flowers, besides a good many *Crambi* and other *Pyralides*, and several species of *Depressaria*. On the heather and bracken of the older parts of the sandhills other species occur, but the only noticeable one is *Gnophos obscurata*, which is very abundant.

Micro-lepidoptera are abundant, and several good species occur, such as *Anerastia lotella*, *Crambus Warringtonellus*, *C.*

geniculeus, *Dictyopteryx Bergmanniana* amongst *Rosa spinosissima*, and many small *Gelechidæ*, which can be obtained by kicking them out of the roots of the bent, where they shelter during the day-time.

Insects are abundant in the woods of Donard demesne throughout the season. *Lycœna argiolus* (Holly Blue) is out in May and *Argynnis paphia* (Silver-washed Fritillary) in July, but the latter is scarce. No *Sphinges* seem to occur, and not many *Bombyces*, but *Hylophila prasinana* is common, also *Hepialus velleda*, *H. hectus*, and *Thyatira batis*. The latter comes to sugar along with various *Noctuæ*, such as *Acronycta rumicis*, *Hadena adusta*, and *Caradrina taraxaci*, and *Aphomia sociella*, whose larva feeds on the wax in bee-hives and the nests of wild bees.

The *Geometræ* are well represented, including several uncommon species, especially among the fir-feeding kinds. *Ellopia prosapiaria* is common, also *Bupalus piniaria* and *Boarmia repandata*, and the fine banded variety *conversaria*. *Venusia cambrica* and *Emmelesia teniata* are scarce. Several *Eupithecia* occur, including *E. satyrata*, *castigata*, *lariciata*, and *pumilata*. The last feeds on the flowers of *Ulex*, and swarms both in the higher parts of the demense and in the lower valleys. The pretty *Melanthia albicillata* may be seen settled on tree trunks in July. *Thera variata* is very abundant, but *T. firmata* is scarce. Micros are not very abundant, and only *Amblyptilia acanthodactyla* and *Olindia ulmana* are worth noting.

Collecting on the mountains themselves is rather disappointing, especially in the number of specimens obtained. I have sometimes walked several miles without seeing a specimen of any sort, and this on a fine day in summer. Nevertheless, a good many species occur, and I believe that a resident collector could do very good work when he had once found the right spots for insects.

This paucity of insects no doubt is due to the poverty of the flora of the Mourne range. There are no truly alpine insects recorded from the district, but then only Slieve Donard rises

appreciably over 2,400 feet, which is the lowest limit of alpine insects, and the upper part of this mountain is too bare and shelterless for Lepidoptera to exist there.

The most promising-looking parts for such insects are the actual tops of the few mountains which are crowned with rocks, like Bingian, Bearnagh, and Commedagh. Round these rocks the vegetation is luxuriant, and *Salix herbacea* grows freely. A few species occurring lower down may be mentioned. *Saturnia pavonia* is common, and its larva, together with that of *Dicranura vinula* and *Pygæra pigra*, is common on willow bushes by the streams. *Hadena contigua* occurs, *Anarta myrtilli* is common, also *Stilbia anomola*, *Pachnobia rubricosa* and *Phytometra viridaria*. The *Geometræ* include *Gnophos obscurata*, *Pseudoterpna pruinata*, *Scodiona belgiaria*, *Larentia cæsiata*, *Eupithecia nanata*, *E. minutata* and *E. sobrinata*—this last feeding on juniper. A few micros may be mentioned:—*Phycis fusca* occurs in the Happy Valley and also above Donard demesne, *Mixodia Schulziana* is pretty common, and *Pamplusia mercuriana* occurs at the top of Slieve Bingian.

No doubt further search would result in many additions to this rather meagre list, but there is so large an extent of country to be covered that for anyone living at a distance it would take many years to make anything approaching a complete list of the lepidoptera of the Mournes.

In conclusion, I may say that specimens of nearly all the species mentioned are now in the Belfast Museum collection, and that it is much to be hoped that some member of the Club will take up this branch of field work and add to our knowledge of our local Lepidoptera.

LIST OF SPECIES.

RHOPALOCERA.

Pieris brassicæ—Common.
rapæ—Common.
napi—Common. Occurs in the marshes on the Belfast hills up to 900 feet. The specimens are generally strongly marked on upper side, and the under side is sometimes very yellow.
Euchloë cardamines—Common. I have specimens from the Belfast hills expanding only 30 mm.
Argynnis paphia—Donard demesne and other woods, but not common.
Vanessa urticæ—Common.
atalanta—Not common generally, but very abundant in 1893.
cardui—Common in some years.
Pararge egeria—Very abundant in all woods and lanes, from May to October.
megæra—Local; Islandmagee, Newcastle, &c.
Satyrus semele—Very abundant on sandhills, Newcastle, &c.; the specimens are large and brightly coloured.
Epinephele janira—Common. Large and well marked; females, with *bipupilled ocellus* and extra *ocelli*, sometimes occur.
hyperanthus—Common.
Cœnonympha pamphilus—Common.
Polyommatus phlæas—Common.
Lycæna icarus—Common. Large; males often very bright blue; females also very blue, with the marginal red spots strongly developed, and occasionally the discoidal spots on both wings are white-ringed.
argiolus—Donard demesne; common.
minima—Antrim coast. Very abundant on Islandmagee; male often bluer than type, and some times showing the discoidal spots as in *L. argiolus*.

[None of the *Hesperidæ* are recorded from this district.]

SPHINGES.

Acherontia atropos—Lisburn, &c.; scarce.
Deilephila livornica—Two specimens taken at rhododendron flowers in Ormeau Park, Belfast, June, 1888.
Chærocampa elpenor—Larvæ occasionally on *Epilobium hirsutum* about Belfast.
Smerinthus populi—Common.
Macroglossa stellatarum—Scarce.
bombyliformis—Common on Belfast hills.
Zygæna filipendulæ—Common.

BOMBYCES.

Xylophila prasinana—Common.
Hudaria mundana—Newcastle, &c.; scarce.
Euchelia jacobææ—Common.
Nemeophila plantaginis—Islandmagee, very abundant; Belfast hills.
Arctia caja—Common.

Spilosoma fuliginosa—Common.
mendica — Common; males apparently always cream-coloured.
lubricipeda—Common.
menthastri — Very abundant; some specimens nearly immaculate, and ochreous specimens (var. *ochracea*) are common, sometimes with the wing-rays white.
Hepialus humuli—Very abundant.
velleda — Very abundant; var. *gallicus* also common.
hectus—Common.
Orgyia antiqua—Larvæ scarce.
Bombyx rubi—Larvæ common on hills.
quercus, var. callunæ—Larvæ common.
Saturnia pavonia—Very common on hills.
Dicranura vinula—Common.
Lophopteryx camelina—Common.
Notodonta dictæa—Scarce.
dromedarius—Scarce, Belfast.
ziczac—Larvæ not uncommon on Willow.
Phalæra bucephala—Common.
Pygæra pigra—Larvæ on willow, Mourne Mountains.
Thyatira derasa — Collin Glen; common.
batis—Very common.

NOCTUÆ.

Bryophila perla—Newcastle.
Aconycta psi—Common.
rumicis — Donard demesne; a pale form.
Leucania conigera—Belfast marshes.
lithargyria—Common.
comma—Common.
impura—Very abundant.
pallens — Very abundant; var. *rufescens* common.
Tapinostola fulva — Very abundant in marshes near Belfast; varies from pale bone-colour to dark reddish.
Nonagria arundinis—Local in Co. Down.
Hydræcia nictitans—Most, if not all, the specimens from this district are referable to *H. lucens*.
micacea—Common.
Xylophasia rurea — Very abundant; var *combusta* also common.
lithoxylea—Very abundant.
monoglypha — Very abundant; var. *brunnea* (Tutt) is common and var. *obscura* (Tutt) scarce.
Neuronia popularis—Belfast.
Charæas graminis — Very abundant.
Eupetina testacea—Belfast; common.
Mamestra brassicæ—Common.
Apamea basilinea—Common.
Apamea ophiogramma — One specimen in a marsh near Belfast.
gemina—Common.
leucostigma—The type and var. *fibrosa* are both common in the marshes about Belfast and elsewhere in the district.
didyma—Very abundant.
Miana strigilis—The type is scarce, but the darker varieties fairly common.
fasciuncula — Common; small grey specimens occur on the hills in August.
literosa—Not common, but generally distributed.
bicoloria—Very abundant; var. *rufuncula* is not uncommon.
Celæna Haworthii—Common on Belfast hills.
Grammesia trigrammica—Common.
Stilbia anomala—Common in one place on Black Mountain, Belfast; also occurs in the Mourne Mountains The specimens are large and dark.
Caradrina taraxaci—Common.
4-punctata—Very abundant; the specimens from this district are generally either ochreous or dark grey.
Rusina tenebrosa—Belfast scarce.

Agrotis vestigialis — Sand-hills, Dundrum; abundant.
segetum—Common.
exclamationis—Common.
cursoria—Sand-hills; common.
nigricans—Common.
tritici—Sand-hills; very abundant; mostly reddish brown.
strigula—Belfast hills, abundant.
præcox—Sand-hills, common.
lucernea—Sand-hills at Dundrum; dark grey.
Noctua glareosa — Belfast hills, abundant.
augur—Common.
plecta—Common.
c-nigrum—Common.
brunnea—Common.
festiva—Common.
umbrosa—Very abundant.
rubi—Common.
baja—Common.
Triphæna ianthina—Common.
comes—Common.
pronuba—Common.
Amphipyra tragopogonis—Common.
Mania typica—Common.
maura—Common.
Tæniocampa gothica — Very abundant at willows in spring.
incerta—Very abundant, but not very variable, most of the specimens being dark brown.
opima — Belfast; both the pale type and var. *brunnea* (Tutt).
stabilis—Very abundant.
Orthosia lota—Belfast, common.
Cerastis vaccinii—Common at ivy-bloom.
spadicea—Common at ivy-bloom.
Scopelosoma satellitia — Common at ivy-bloom.
Xanthia fulvago—Belfast, scarce.
circellaris—Belfast, scarce.
Cirrhœdia xerampelina—Belfast and Castlewellan.
Calymnia trapezina—Common.
Dianthœcia nana — Common in marshes.
capsincola—Common.
cucubali—Common.
Polia chi—Glenarm.
Miselia oxyacanthæ—Common.
Agriopis aprilina—Common.
Euplexia lucipara—Common.
Aplecta nebulosa—Common.
Hadena adusta—Donard demesne and Black Mountain; common.
glauca — Belfast hills, common. The specimens belong to var. *lappo* (Dup.)
dentina—Common.
trifolii—Common.
oleracea—Common.
pisi—Scarce.
contigua — Mourne Mountains, scarce.
Calocampa exoleta—Belfast, &c.; common.
vetusta—Belfast, &c; common.
Cucullia umbratica—Donard demesne, scarce.
Gonoptera libatrix—Common.
Habrostola tripartita—Common.
triplasia—Common.
Plusia chrysitis—Common.
festucæ—Common.
pulchrina—Common.
gamma—Common.
Anarta myrtilli—Mourne Mountains, common.
Phytometra viridaria — Mourne Mountains and Belfast hills; common.
Rivula sericealis—Common.
Zanclognatha griscalis—Common.
tarsipennalis—Common.
Pechypogon barbalis—Common.
Hypena proboscidalis—Very abundant.

GEOMETRÆ.

Ourapteryx sambucata—Belfast.
Epione apiciaria—Belfast, scarce.
Rumia luteolata—Very abundant.
Metrocampa margaritaria—Common.
Ellopia fasciaria — Donard demesne, common.
Selenia bilunaria—Common.
Odontopera bidentata—Common.
Crocallis elinguaria—Common.

Ennomos quercinaria — Tollymore Park, &c.
Phigalia pedaria—Common; large and pale coloured.
Nyssia zonaria—Ballycastle, very abundant.
Amphidasys betularia—Common.
Boarmia repandata — Common; rather dark; var. *conversaria*, Donard demesne, scarce.
gemmaria—Common.
Tephrosia crepuscularia—Donard demesne, common; dark varieties frequently occur.
Gnophos obscurata — Newcastle, abundant; very dark.
Pseudoterpna pruinata—Common.
Venusia cambrica—Donard demesne, scarce.
Acidalia didimiata—Common.
bisetata—Common.
marginepunctata—Kilkeel, scarce.
aversata—Common; var. *spoliata*, common.
Cabera pusaria—Very abundant; the specimens from this district are rather more sprinkled with black scales than is the case with English specimens.
exanthemaria—Very abundant.
Macaria liturata — Donard demesne.
Strenia clathrata—Common; the yellow parts of the wings pale, inclining to white.
Scodiona belgiaria—Mourne Mountains.
Ematurga atomaria—Hills, abundant.
Bupalus piniaria — Donard demesne, very abundant.
Abraxas grossulariata—Common.
Lomaspilis marginata—Common.
Hybernia rupicapraria—Common.
marginaria — Common; dusky, ill-marked specimens are frequent.
defoliaria—Common.
Cheimatobia brumata—Common.
Oporabia dilutata—Common.
filigrammaria—Belfast hills.
Larentia didymata—Very abundant.
multistrigaria—Common, generally of an ochreous tint.
cessiata—Belfast hills, abundant; Mourne Mountains, scarce.
salicata—Belfast hills, common.
olivata—Glenariffe.
viridaria—Common.
Emmelesia alchemillata—Bryansford.
albulata — Common; dark and well marked.
decolorata—Belfast, locally abundant.
taeniata—Donard demense, very rare.
Eupithecia oblongata—Common.
satyrata—Common; var *callunaria*, very abundant on hills; very variable, some specimens approaching v. *Curzoni*.
castigata—Common; occasional melanic specimens occur.
indigata—Belfast.
constrictata—Islandmagee, common; Kilkeel.
nanata—Common on hills.
vulgata—Common.
absynthiata—Common.
minutata—Common.
assimilata—Common.
lariciata—Collin Glen; Larne, very abundant.
abbreviata—Scarce.
sobrinata—Belfast, and Mourne Mountains, scarce.
pumilata—Common; very abundant on Mourne Mountains.
Thera variata—Common.
firmata—Donard demesne, scarce.
Hypsipetes trifasciata—Common; very abundant in Collin Glen.
sordidata—Common.
Melanthia bicolorata—Glenarm, Collin Glen, &c., not common.
ocellata—Collin Glen, &c.
albicillata — Donard demesne, common.
Melanippe tristata — Knockagh, abundant; Mourne Mountains.
sociata—Common.
montanata—Very abundant.

galiata—Local, not common.
fluctuata—Common.
Anticlea badiata—Very abundant.
nigrofasciaria—Collin Glen, scarce.
Coremia munitata—Local, scarce.
designata—Scarce.
ferrugata—Common.
unidentaria—Common.
Camptogramma bilineata—Very abundant.
Phibalapteryx lapidata—Belfast Hills.
vittata—Belfast marshes, very abundant.
Oidaria miata—Common.
truncata—Common, mostly var. *perfuscata*.
immanata—Common.
saffumata—Common.
silaceata—Collin Glen, common.
testata—Hills, common.
populata—Common.
fulvata—Common.
Pelurga comitata—Common.
Eubolia limitata—Very abundant.
plumbaria—Very abundant.
Anaitis plagiata—Black Mountain, common.

PYRALIDES.

Pyralis glaucinalis—Common.
farinalis—Common.
Scoparia ambigualis—Scarce.
cembræ—Belfast, common.
dubitalis—Common.
ingratella—Knockagh, common.
truncicololella—Donard demesne.
augustea—Dundrum.
Nomophila noctuella—Common.
Herbula cespitalis—Common.
Ennychia cingulata—Knockagh, common.
Surrhypara urticata—Common.
Scopula lutealis—Very abundant.
olivalis—Common.
prunalis—Collin Glen, &c.
ferrugalis—Islandmagee, scarce.
Botys fuscalis—Common.
Ebulea sambucalis—Common.
Pionea forficalis—Common.
Cataclysta lemnata—Common.
Hydrocampa stagnata—Common.
Chrysocorys festaliella—Belfast.
Platyptilia ochrodactyla—Dunnaneile Island, Strangford Lough.
isodactyla—Belfast Hills, scarce.
gonodactyla—Common.
Amblyptilia acanthodactyla—Newcastle and Belfast, scarce.
Oxyptilus parvidactyla—Knockagh, abundant.
Mimeseoptilus bipunctidactylus—Black Hill, &c., abundant.
pterodactylus—Black Hill, abundant.
Pterophorus monodactylus—Common.
Aciptilia tetradactyla—Islandmagee, scarce.
Chilo phragmitellus—Black Mountain, scarce.
Crambus pratellus—Common.
perlellus—Common.
warringtonellus—Sandhills, common.
geniculeus—Sandhills, common.
culmellus—Very abundant.
tristellus—Common.
hortuellus—Common.
Homeosoma senecionis—Newcastle, scarce.
Phycis fusca—Mourne Mountains.
subornatella—Islandmagee, rare.
Aphomia sociella—Common.

TORTRICES.

Tortrix crataegana—Common.
xylosteana—Scarce.
rosana—Scarce.
diversana—Common.
unifasciana—Belfast Hills, &c., common.
costana—Common.
viburnana—Hills, common.

palleana—Black Hill, &c., common.
viridana—Common.
Peronea Schalleriana — Islandmagee.
variegana—Common.
hastiana—Belfast, scarce.
caledoniana—Hills, common.
Teras contaminana—Common.
Dictyopteryx Loeflingiana—Common.
Holmiana—Belfast, scarce.
Bergmanniana—Very abundant.
Argyrotoxa Conwayana—Common.
Penthina sauciana—Common.
gentiana—Common.
Antithesia salicella—Belfast, scarce.
Hedya ocellana—Common.
Spilonota trimaculana — Common.
Pardia tripunctana—Common
Sericoris littoralis—Islandmagee.
cespitana—Common.
lacunana—Very abundant
Mixodia Schulziana—Hills, common.
Orthotænia antiquana—Belfast.
Cnephasia politana—Donard demesne, &c., common.
musculana—Common.
Sciaphila virgaureana — Common.
chrysantheana—Common.
octomaculana—Rare.
Sphaleroptera ictericana—Scarce.
Clepsis rusticana—Common.
Bactra lanceolana—Very abundant.
Phoxopteryx myrtillana—Belfast Hills, scarce.
lundana—Very abundant.
Grapholitha nigromaculana—Mourne Mountains.
subocellana—Very abundant.
trimaculana—Belfast.
Penkleriana—Common.
nœvana—Common
Batodes angustiorana—Belfast.
Pœdisca bilunana—Belfast, scarce.
corticana—Belfast, common.
Ephippiphora cirsiana — Common.
brunnicheana—Common.
Olindia ulmana—Donard demesne, scarce.
Pamplusia mercuriana—At top of Slieve Bingian (2400 feet).
Stigmonota perlepidana—Collin Glen, abundant.
Dicrorampha plumbana—Knockagh, abundant.
Catoptria ulicetana—Very abundant.
hypericana—Belfast Hills.
cana—Belfast Hills.
citrana—Belfast, scarce.
Simœthis oxyacanthella—Very abundant.
Bupœcilia dubitana—Belfast, scarce.
atricapitana—Belfast, scarce.
angustana—Common.
griseana—Scarce.
ciliella—Hills, common.
Xanthosetia zœgana—Common.
hamana—Common.
Argyrolepia Hartmanniana—Belfast Hills, local.
Conchylis straminea—Islandmagee.
Aphelia osseana—Common.

TINEÆ.

Diurnea fagella—Common; always ochreous.
Scardia cloacella—Common.
Blabophanes rusticella—Common.
Tinea pellionella—Common.
pallescentella—Common.
lapella—Common.
merdella—Common.
Lampronia luzella—Belfast, scarce.
Nemophora Schwarziella—Common.
Swammerdamia cæsiella—Very abundant.
pyrella—Common.
spiniella—Common.

Hyponomeuta padellus—Common.
cagnagellus—Locally common.
Prays curtisellus—Common.
Plutella cruciferarum—Common.
Cerostoma radiatella—Common.
costella—Common.
Harpipteryx xylostella—Common.
Phibalocera quercana—Common.
Depressaria costosa—Very abundant.
pallorella—Scarce.
umbellana—Newcastle, scarce.
arenella—Common.
liturella—Common.
yeatiana—Common.
applana—Common.
heracleana—Common.
Gelechia ericetella—Common.
Bryotropha terella—Belfast.
desertella—Newcastle sand-hills.
politella—Belfast.
Lita artemisiella—Newcastle sand-hills.
marmorea—Newcastle sand-hills, very abundant.
Teleia vulgella—Scarce.
dodecella—Belfast Hills, scarce.
Cherlaria Hubnerella—Belfast.
Pleurota bicostella—Hills, common.
Œcophora pseudospretella—Common.
Endrosis fenestrella—Common.
Glyphipteryx thrasonella—Very abundant in marshes.
Haworthana—Belfast, scarce.
equitella—Islandmagee, abundant.
Fischeriella—Common.
Argyresthesia ephippella—Belfast.
nitidella—Common.
semitestacella—Belfast, scarce.
albistria—Belfast, common.
conjugella—Common.
mendica—Common.
pygmæella—Scarce.
Gracilaria tringipennella—Islandmagee, scarce.
syringella—Common.
Ornix anglicella—Belfast.
betulæ—Belfast.
Coleophora albicosta—Belfast.
cæspititiella—Common.
Chauliodus chærophyllellus—Belfast.
Laverna atra—Belfast.
Blachista monticola—Ballynahinch.
perplexella—Common.
obscurella—Common.
rhynchosporella—Belfast, scarce.
rufocinerea—Belfast, scarce.
subalbidella—Very abundant.
argentella—Very abundant.
Lithocolletis pomifoliella—Belfast.
salicicolella—Belfast.
quercifoliella—Belfast, common.
alnifoliella—Belfast.

A SUPPLEMENT

TO THE

FLORA

OF THE

NORTH-EAST OF IRELAND

OF

STEWART AND CORRY.

BY

S. A. STEWART, F.B.S.EDIN.,

AND

R. LLOYD PRAEGER, B.E.

BEING AN APPENDIX (NO. 5 OF VOL. 2) TO THE PROCEEDINGS OF THE

BELFAST NATURALISTS' FIELD CLUB

FOR 1894-95.

NOTE.

The size of the page in the following paper has been made the same as that of "*Flora of the North-East of Ireland*," in order that the Supplement may be bound with the Work by those who desire it.

A SUPPLEMENT

TO THE

"FLORA OF THE NORTH-EAST OF IRELAND"

OF STEWART AND CORRY.

BY S. A. STEWART, F.B.S.EDIN., AND R. LLOYD PRAEGER, B.E.

IT is now within a few months of seven years since the *Flora of the North-East of Ireland* was published, affording botanists a summary of our knowledge of local topographical botany, and giving a general account of the flora of the twelfth district of *Cybele Hibernica*. Since that time, considerable progress has been made; a goodly number of species have been added to the flora, and our knowledge of the distribution of others has been augmented to a noteworthy degree. Since the publication of *Flora* several papers have appeared summarizing the more important additions, and others dealing with the botanical characteristics of certain tracts of country, or with certain groups of plants within our district. There have also appeared scattered notes on the local flora in Journals, and Proceedings of Societies. Our present object has been to bring all these together, along with a considerable amount of unpublished material, and no pains have been spared to make this Supplement complete and trustworthy, by inviting the assistance of local botanists, by examining herbaria, and published and unpublished matter not accessible formerly, and by carrying out systematic field work in selected districts, and searches for plants whose local status required investigation.

Being a Supplement to the *Flora of the North-East of Ireland*, the present paper divides itself into two sections:—(1) Plants or records to be removed from the *Flora*; and (2) plants or records to be added to the *Flora*. The former category, we are glad to say, is soon disposed of. The following species must be withdrawn from the list of native and naturalized plants, for the reasons stated in the systematic list that follows:—

Ononis spinosa.
Rosa micrantha.
Silaus pratensis.
Calamintha officinalis.
Primula veris.

A few varieties have also to be withdrawn, and a few records require to be transferred to plants different from those under which they were published; these corrections are made in their proper place.

There are a number of other plants for which no recent record could be given in *Flora*, and for the presence of which in the district now we cannot vouch, although many of them have been specially sought for, for the purpose of this Supplement; and there are a few others which recent changes have driven from former haunts. The refinding of these plants is much to be desired, so we draw attention here to the more prominent of them. They may be subdivided as follows:—

(1) Plants of which we have reason to doubt the identification:—

Leontodon hispidum. *Gentiana amarella.*

(2) Plants which appear to have been not established in the district, and now missing:—

Sisymbrium sophia. *Solanum nigrum.*
Sinapis nigra. *Chenopodium rubrum.*

(3) Plants apparently destroyed through drainage; these are mostly plants of Lough Neagh basin:—

Rhamnus catharticus. *Carex elongata.*
Lathyrus palustris. *C. filiformis.*
Sium latifolium. *C. paludosa.*
Epipactis palustris. *Lastrea thelypteris.*
Cephalanthera ensifolia. *Pilularia globulifera.*

(4) Plants apparently lost though building or cultivation:—

Eleocharis uniglumis. *Hordeum pratense.*
Schlerochloa procumbens.

Three other plants:—*Hypericum hirsutum*, *Adoxa moschatellina*, *Carex muricata*, have become almost extinct owing to similar causes.

(5) Plants not seen recently, but for whose absence no special reason exists:—

Geranium sanguineum. *Taxus baccata.*
Trifolium striatum. *Calamagrostis epigejos.*
Pyrus aria. *Poa nemoralis.*
Arctostaphylos uva-ursi. *Polypodium dryopteris.*
Pyrola secunda. *Tolypella nidifica.*

We trust that our drawing attention to the above may lead to the rediscovery of some of them.

Turning now to the second part of our work—additions to the *Flora*—we find a considerable amount of new matter available, thanks to the diligence of a number of northern botanists. The chief systematic investigations carried out in our district since the publication of *Flora* have been the exploration of the Mourne Mountains district for cryptogams by Mr. Lett, and for phanerogams by the present writers; and the examination of the valley of the Lower Bann by Mrs. Leebody, Miss Knowles, and R. Ll. P. The subjoined list shows the various sources from which the material of the present Supplement has been drawn.

SOURCES OF INFORMATION.

BOOKS—

English Botany; Supplement to Vols. I—IV. By N. E. Brown. 1892.

The British Moss Flora, by Dr. Braithwaite, Vols. I. and II., 1880-95.

PERIODICALS—

Journal of Botany, 1888 to date. Contains some notes concerning the local flora.

Irish Naturalist, 1892 to date. Papers and notes, the more important papers being:—

Stewart, S. A.—Notes on the Flora of the North-East of Ireland, 1894.

Shoolbred, W. A.—A Botanical Trip to Co. Antrim, 1894.

Groves, H. & J.—The Distribution of the Characeæ in Ireland, 1895.

PROCEEDINGS OF SOCIETIES—

Royal Irish Academy. The papers consulted are:—

Hart, H. C.—Plants of some of the Mountain Ranges of Ireland, 1884. This paper yielded some notes additional to those already extracted from it.

Lett, Rev. H. W.—Report on the Mosses, Hepatics, and Lichens of the Mourne Mountain district, 1890.

Hart, H. C.—Range of Flowering Plants and Ferns on the Mountains of Ireland, 1891. Yields very little additional to the former paper.

Stewart, S. A., and R. Lloyd Praeger.—Botany of the Mourne Mountains, 1892. Our increased knowledge of the Co. Down flora is mainly due to this paper, and that by Rev. Mr. Lett.

Belfast Naturalists' Field Club, 1888-9 till 1894-5. Papers and notes, including plants found on the Excursions.

Praeger.—New or Rare North of Ireland Plants, 1891.

Do. —Local Botanical Notes, 1891 and 1892; 1893.

Botanical Exchange Club Reports, 1888 till 1894.

Watson Botanical Exchange Club Reports, 1885—6 till 1893—4.

MS. NOTES AND LISTS—

Templeton, John. Four volumes of his MS. "Flora Hibernica," at present deposited with the Belfast Nat. Hist. and Phil. Society. Contains much original matter concerning local cryptogams, which could not be worked out in time for the present paper.

Brown, Robert. We are indebted to Mr. James Britten for a transcript of local notes contained in the two volumes of MS. in British Museum, mentioned in his review of *Flora N.E. Ireland* in *Journ. Bot.* 1888.

Leebody, Mrs.
Knowles, Miss M. C.
Lett, Rev. H. W.
Waddell, Rev. C. H.
Brenan, Rev. S. A.
Smith, Rev. W. S.
Davies, J. H.

} Notes referring to various districts, kindly supported by specimens when requested.

To several other observers we are indebted for occasional notes of plants observed by them in new stations, and for specimens sent.

HERBARIA—

Moore, David. The greater portion of the original and duplicate sets representing the flora of Co. Antrim, and of the duplicate set representing the flora of Co. Derry, made by Dr. Moore in 1836 and 1837, when in the Ordnance Survey service, are deposited in the Dublin Science and Art Museum. The duplicate set is unfortunately not localized.

Trinity College, Dublin. The British Herbarium, which includes the northern collection of Rev. W. M. Hind, was looked into, but yielded nothing of importance for our purpose.

Glasnevin Botanic Garden. The British Herbarium contains some of Dr. Moore's northern plants, but too little was found to induce a thorough examination of the collection.

Grainger, Rev. Canon. A small collection, made chiefly in Antrim, which yielded a few notes.

The addition of our own MS. notes to this list completes the enumeration.

The notes now brought together include a number of important additions to the flora of the north-eastern province. In the lists of additions which follow, the members of two critical genera—*Rubus* and *Hieracium*—figure largely. While the value of the multitudinous "species" into which these genera are now divided must not be over-estimated, it is none the less important that the distribution of the various forms should be accurately worked out, and in this respect our district is now behind no other in Ireland. Some interesting species have been added, such as *Carex pauciflora* (a good addition to the Irish flora), *Polygonum maculatum* and *Sparganium neglectum*, of which we are not aware of any previous record from Ireland, *Spiranthes Romanzoviana* (in Europe known only in two other Irish counties), *Ranunculus circinatus*, *Drosera intermedia*, *Saussurea alpina*, *Orchis pyramidalis*, *Carex aquatilis*. The following lists show the additions to the Phanerogams and higher Cryptogams of District 12 and to each of the three counties that compose it, the Mosses and Hypatics being treated separately on a subsequent page.

ADDITIONS TO DISTRICT 12.

Ranunculus circinatus.
Drosera intermedia.
Trifolium hybridum.
Poterium sanguisorba.
Rubus Rogersii.
nitidus.
gratus.
erythrinus.
Lindleianus.
pulcherrimus.
silvaticus.
micans.
Leyanus.
echinatus.
rudis.
scaber.
fuscus.
rosaceus.
hirtus.
chamæmorus.
Rosa glauca.
Arctium minus.
Saussurea alpina.
Hieracium Leyi.
Farrense.
rubicundum.
argenteum.
Sommerfeltii.
hibernicum.
stenolepis.
euprepes.
sciaphilum.
auratum.
Polygonum maculatum.
Orchis pyramidalis.
Spiranthes Romanzoviana.
Sparganium neglectum.
Potamogeton undulatus.
Carex pauciflora.
aquatilis.
filiformis.
Triticum acutum.
Chara contraria.

ADDITIONS TO COUNTY DOWN.

Ranunculus circinatus.
Lepidium campestre.
Drosera intermedia.
Sagina ciliata.
Spergularia rubra.
Hypericum quadrangulum.
Trifolium hybridum.
Rubus suberectus.
plicatus.
Rogersii.
nitidus.
Lindleianus.
pulcherrimus.
silvaticus.
mucronatus.
Leyanus.
rudis.
scaber.
fuscus.
rosaceus.
hirtus.
Rosa involuta.
Epilobium angustifolium.
Saxifraga tridactylites.
Inula helenium.
Saussurea alpina.
Hieracium argenteum.
hibernicum.
sciaphilum.
gothicum.
auratum.
Galeopsis speciosa.
Polygonum maculatum.
Salix purpurea.
Populus tremula.
Sparganium neglectum.
Potamogeton Zizii.
Ruppia rostellata.
Eleocharis acicularis.
Carex Œderi.
Bromus racemosus.
Triticum acutum.
Chara contraria.

ADDITIONS TO COUNTY ANTRIM.

Arabis hirsuta.
Geranium perenne.
Trifolium hybridum.
Poterium sanguisorba.
Rubus gratus.
Lindleianus.
pulcherrimus.
echinatus.
rosaceus.
Rosa glauca.
Arctium minus.
Hieracium flocculosum.
Farrense.
rubicundum.
Hieracium stenolepis.
euprepes.
auratum.
Vaccinium oxycoccos.
Utricularia intermedia.
Callitriche autumnalis.
Orchis pyramidalis.
Juncus maritimus.
Potamogeton undulatus.
Carex pauciflora.
aquatilis.
filiformis.
Schlerochloa rigida.
Triticum acutum.

ADDITIONS TO COUNTY DERRY.

Papaver rhœas.
Meconopsis cambrica.
Viola canina.
Sagina apetala.
Spergularia salina.
Ononis arvensis.
Trifolium hybridum.
Rubus rhamnifolius.
gratus.
pulcherrimus.
Lindleianus.
erythrinus.
micans.
chamœmorus.
Myriophyllum spicatum.
Galium mollugo.
Hieracium Leyi.
Sommerfeltii.
Hieracium stenolepis.
euprepes.
Myosotis collina.
Veronica polita.
Beta maritima.
Atriplex erecta.
Orchis pyramidalis.
Spiranthes Romanzoviana.
Carex teretiuscula.
stricta.
paludosa.
riparia.
Trisetum flavescens.
Ceterach officinarum.
Chara aspera.
contraria.
vulgaris.
Nitella translucens.

As it must ever be, there has been in some cases doubt as to what plants, originally introduced, must now be included in the flora as thoroughly naturalized, and which may be considered as not permanently established. Time alone can settle these points, and we have preferred to err on the side of severity rather than of leniency as regards admissions to the flora on the plea of naturalization. The number of foreign plants introduced into the country is increasing, along with the increased imports of foreign grain and seed, and no doubt some of the hardy continental species thus introduced have obtained, or will obtain, a permanent footing in the island. The following extraordinary list of imported

plants, collected by Mr. Richard Hanna in 1893 and 1894 in waste ground adjoining the Belfast Distillery, and near Hughes' Flour Mill, will convey an idea of the number of aliens that are now-a-days showered down on our country:

Ranunculus muricatus.
Sisymbrium repandum.
S. pannonicum.
S. columnæ.
S. sophia.
S. thalianum.
Lepidium draba.
L. campestre.
L. perfoliatum.
Camelina sativa.
Reseda lutea.
R. suffruticulosa.
Saponaria baccaria.
Silene inflata.
S. dichotoma.
Lychnis vespertina.
Geranium phæum.
G. pratense.
Melilotus arvensis.
M. parviflora.
Medicago denticulata.
M. falcata?
Trifolium arvense.
T. resupinatum.
T. latipaceum.
Trigonella cærulea?
Lonicera caprifolium.
Valerianella dentata.
Anthemis cotula.
Hemizonia sp.
Serratula tinctoria.
Centaurea solstitialis.
Carduus crispus.
Solanum nigrum.
Echium vulgare.
Amsinckia lycopsoides.
Salvia verticillata.
Stachys annua.
Marrubium vulgare.
Plantago arenaria.
Rumex palustris.
Hemerocallis flava.
Setaria viridis.
Ægilops ovata?
Æ. caudata.
Echinochloa crus-galli.
Bromus tectorum.

The plants were introduced with foreign grain, Australian, Indian, Russian, and American. A smaller group found by Mrs White-Spunner at Greenisland, whither they came with food for fowls, is given by R. Ll. P. in *Irish Naturalist* for 1893.

Sisymbrium sophia.
Thlaspi arvense.
Erysimum orientale.
Lychnis vespertina.
Linum perenne.
Melitotus alba.
Cichorium intybus.
Hyoscyamus niger.
Linaria sp.
Galeopsis speciosa.

Other similar lists might be quoted, but the above will serve as examples.

During the interval since the publication of the *Flora* much has been done to extend our knowledge of the *Musci* and *Hepaticæ* of the district. The workers, indeed, have been few, our notes being derived mainly from Rev. H. W. Lett and Rev. C. H. Waddell, to whose zeal and powers of observation we are indebted for by far the larger portion of the information summarised in the following pages.

In 1888 the number of species of mosses known to grow in north-east Ireland

stood at 293, and the hepatics, or scale-mosses, at 73. The present enumeration brings the former up to 301, and the latter to 84. Almost a moiety of the mosses known to occur in the British Islands, and more than a moiety of the scale-mosses, are still *desiderata* for our district. That in the future our lists will be added to cannot be doubted, especially in the minute and critical species. The publication of Dr. Braithwaite's splendid "British Moss Flora" has been a stimulus to present workers, and its completion cannot fail to stimulate and facilitate future researches. A similar Monograph of British *Hepaticæ* would be a boon. That this interesting group of plants is still imperfectly known to us is largely due to the want of such help. The publishing of additional species is, however, the smaller portion of the labour of the local botanist. A great amount of work has been done, and much remains to be done, in extending our knowledge of the range and frequency of the plants already on record.

These lists might have been larger had a laxer method of compilation been adopted. Many notes have been held over where satisfactory specimens were not forthcoming, and doubtless some of these excluded records will prove correct hereafter. As regards the few notes of Antrim mosses by Mr. Dixon, they stand on the sufficient authority of that gentleman alone. Extracted from the Templeton MSS. we print at the end a number of localities for hepatics not included in the authenticated list. Many of these are believed to be reliable, while some are manifestly incorrect. No specimens are extant wherewith to test these notes, and their confirmation or otherwise remains for the future.

ADDITIONS TO DISTRICT 12.

Anisothecium crispum.
Polytrichum attenuatum.
Tortula princeps.
Grimmia orbicularis.
G. Hartmani.
Pohlia acuminata.
Mnium riparium.
Hypnum irriguum.
Sphagnum Austini.
S. teres.
Lejeunea microscopica.
Lejeunea Mackaii.
L. patens.
Odontoschisma sphagni.
Leptoscyphus pyrenaicum.
Scapania umbrosa.
Plagiochila tridenticulata.
Jungermannia pumila.
J. crenulata.
Nardia sphacelata.
Lunularia cruciata.

ADDITIONS TO COUNTY DOWN.

Polytrichum attenuatum.
Mollia verticillata.
Grimmia orbicularis.
Pohlia acuminata.
Bryum proliferum.
Hypnum irriguum.
H. Kneiffii.
H. pulchellum.
Sphagnum teres.
Lejeunea Mackaii.
Odontoschisma sphagni.
Cephalozia divaricata.
C. connivens.
Leptoscyphus interruptus.
Scapania umbrosa.
S. curta.
Jungermannia crenulata.
Nardia sphaselata.
Lunularia cruciata.
Anthoceros punctatus.

ADDITIONS TO COUNTY ANTRIM.

Oligotrichum incurvum.
Pottia Starkei.
Anisothecium crispum.
Webera sessilis.
Grimmia trichophylla.
G. Hartmani.
Orthotrichum stramineum.
Tetraplodon bryoides.
Funaria obtusa.
Mnium cuspidatum.
M. riparium.
Hypnum heteropterum.
H. Borreri.
Sphagnum Austini.
S. tenellum.
S. intermedium.
Frullania fragillifolia.
Lejeunea microscopica.
L. calcarea.
L. patens.
L. Mackaii.
Pleurozia purpurea.
Odontoschisma sphagni.
Trichocolea tomentella.
Plagiochila tridenticulata.
Jungermannia pumila.
Nardia hyalina.
Cesia crenulata.
Lunularia cruciata.

The only additions to County Derry are *Polytrichum urnigerum*, *Pottia Heimii*, *Tortula princeps*, *Mollia inclinata*, *Bryum ventricosum* and *Sphagnum subsecundum* var. *obesum*. Several named varieties are also added to preceding counties.

In the systematic list which follows, the authors have personally examined specimens of the greater portion of the plants recorded, and have taken pains to satisfy themselves of the correctness of the remainder. In the case of critical plants, the opinion of an authority has in all cases been obtained and followed. All plants concerning the identity of which there was any doubt, have been omittted; a number of records of *Rubi* are held over for this reason. The sequence and nomenclature of *Flora* have been followed throughout for sake of uniformity, except in those critical genera where the greatly extended knowledge which now prevails rendered it necessary to introduce the present terminology—thus the *Hieracia* are arranged and named according to Mr. Hanbury's list in *Journal of Botany*, July 1894, and Rev. Moyle Rogers has kindly revised our *Rubus* list so as to bring it into accordance with the ninth edition of *London Catalogue*.

We have to acknowledge gratefully assistance received in their special departments from Mr. J. G. Baker, Mr. Arthur Bennett, Monsieur Crepin, Messrs H. and J. Groves, Mr. F. J. Hanbury, and Rev. W. Moyle Rogers; to all of whom, as well as the various local botanists who have contributed, our best thanks are due.

For the editing of the *Phanerogamia*, and *Cryptogamia* as far as the end of *Characeæ*, R.Ll.P. is responsible; S.A.S. is accountable for the *Musci* and *Hepaticæ*.

15th May, 1895.

ABBREVIATIONS.

Herb. D.M.—Herbarium of Dr. David Moore, now in Dublin Science and Art Museum.

Hart *R.I.A.*—H. C. Hart: Plants of some of the Mountain Ranges of Ireland. *Proc. Royal Irish Academy*, 1884. The one or two references to Mr. Hart's subsequent report on the Mountain Plants of Ireland are distinguished by the date 1891.

Lett *R.I.A.*—Rev. H. W. Lett: Report on the Mosses, &c., of the Mourne Mountain district, *Proc. Royal Irish Academy*, 1890.

S. & P.—Stewart and Praeger: Report on the Botany of the Mourne Mountains, *Proc. Royal Irish Academy*, 1892.

B.N.F.C.—Proceedings of the Belfast Naturalists' Field Club.

B.E.C.—Botanical Exchange Club Report.

Journ. Bot.—Journal of Botany.

I.N.—Irish Naturalist.

Shoolbred *I.N.*—W. A. Shoolbred, "A Botanical Trip to Co. Antrim," *Irish Naturalist*, 1894.

Groves *I.N.*—H. & J. Groves, "The Distribution of the *Characeæ* in Ireland," *Irish Naturalist*, 1895.

H W.L.—Rev. H. W. Lett, M.A.

C.H.W.—Rev. C. H. Waddell, B.D.

S.A.S.—Samuel Alexander Stewart.

R.Ll.P.—R. Lloyd Praeger.

PHANEROGAMIA.

RANUNCULACEÆ.

Thalictrum minus L., var. β **T. montanum** Wallr. 300—1600 feet.
Down—Pigeon Rock Mountain and Cove Mountain, S. & P.

T. flavum L.
Antrim—Langford Lodge, R.Ll.P.

Ranunculus trichophyllus Chaix.
Down—Lough Leagh (R.Ll.P.), *B.N.F.C.* 1891-2. Ditches below Newtownards, and pool on Conlig Hill, R.Ll.P.
Antrim—Stoneyford Reservoir, R.Ll.P.

R. heterophyllus Fries.
Down—Magheralin, C.H.W. Ditches near Crawfordsburn and Helen's Tower, R.Ll.P. "Moneyreagh River," printed in some copies of *Flora*, should be "Moneycaragh River."

R. Baudotii Godr. The plant recorded from Saintfield under this name in *Watson B.E.C. Report* 1893-94, is transferred to *R. peltatus*.

R. floribundus Bab. Specimens from Clandeboye lower lake have been doubtfully placed under this form by A. Bennett in *Watson B.E.C. Report* 1891-2. Further investigation is required.

R. penicillatus Dum.
Antrim—Abundant in Main R. from Randalstown to Lough Neagh, and in Braid R. at Ballymena, R.Ll.P.

R. peltatus Fries.
Down—Greencastle, Lismacree, and Lough Island Reavy, S. & P. Common in the county.
var. **truncatus** Hiern.
Down—Ballyagherty near Saintfield, C.H.W., *Watson B.E.C.* 1893-4. Lough Mann, C.H.W.

R. circinatus Sibth.
Down—In the Lagan Canal close to its junction with Lough Neagh, R.Ll.P., *B.N.F.C.* 1892-3. An important extension of range.

R. hederaceus L. 0—1000 feet in the Mournes, S. & P.

R. flammula L. Ascends to 1700 feet in the Mournes, S. & P.

var. β **pseudo-reptans** Syme.

Down—Near Hilltown, S. & P.

R. lingua L.

Down—North side of Pollramer Lough, Richd. Hanna. Marshes south of Ballydugan Lake, R.Ll.P.

Derry—Near Dungiven, Mrs. Leebody.

R. auricomus L.

Down—Rostrevor, S. & P. Glen at Knocknagoney near Holywood, R.Ll.P.

Antrim—Cushendall, Herb. D.M. Glendun, S. A. Brenan. Stoneyford, Crumlin, Langford Lodge, R.Ll.P.

Derry—Near Bellarena, Mrs. Leebody.

R. acris L. Ascends to 2450 feet in the Mournes, S. & P.

var. β **R. tomophyllus** Jord.

Down—Near Warrenpoint, S. & P. Perhaps frequent in the district.

R. repens L. Ascends to 1300 feet in the Mournes, S. & P.

Aquilegia vulgaris L.

Down—By the Shimna River near Newcastle, apparently well established, S. & P. It grows here on rough heathy ground, at a distance from any house, and has increased during the last ten years, R.Ll.P.

NYMPHÆACEÆ.

Nymphæa alba L.

Down—In almost every lake and pond.

Derry—Lakelets near Kilrea, and abundant in Killelagh Lough above Maghera, R.Ll.P.

PAPAVERACEÆ.

Papaver hybridum L.

Down—Roadside half-way between Killough and Ardglass, R.Ll.P., *B.N.F.C.* 1892-3.

P. rhœas L.

Down—Ardglass, S.A.S.

Derry—Fields near Magilligan railway station, R.Ll.P.

The plant is still abundant at its old stations, Killough Bay and Lisburn.

[**P. somniferum** L.

Down—Abundant in field near Rostrevor, S. & P.]

Meconopsis cambrica (Linn.) Vig.

Down—Ascends to 1360 feet at Rostrevor, S. & P. It ranges up and down the valley for several hundred feet, being abundant at one spot.

Derry—Magilligan braes, S. A. Brenan.

Glaucium flavum Crantz.

Down—Mill Bay in Carlingford Lough, Leestone near Kilkeel, and refound in Templeton's station "6 miles south of Newcastle" (Glasdrumman), S. & P.

FUMARIACEÆ.

Fumaria capreolata L. var. α **F. pallidiflora** Jord.

Common in Down and Antrim. Derry distribution not yet worked out.

var. β **F. muralis** Sonder.

Down—Saintfield, C.H.W.; *Watson B.E.C. Report* 1893-4.

F. officinalis L.

Frequent throughout Down and Antrim.

CRUCIFERÆ.

Cheiranthus cheiri L.

May fairly be reckoned as a naturalized plant in certain stations in the district, as ancient buildings at Quoile Castle, Carrickfergus Castle, and Larne.

Nasturtium palustre (Willd.) DC.

Down—Rostrevor and Narrow-Water, S. & P. Crossgar, R.Ll.P.

Antrim—Glendun, Shoolbred *I.N.* Bushfoot, R.Ll.P.

Barbarea vulgaris R.Br.

Down—Frequent in the Mourne district, S. & P. Crawfordsburn, Newtownards, Ballygowan, Downpatrick, R.Ll.P.

Derry—Kilrea and Bellarena, Mrs. Leebody.

S. intermedia Bor.

Down—Moygannon, Rostrevor, Killowen, Newcastle, S. & P. Scrabo and Conlig, R.Ll.P.

Antrim—Stoneyford, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

[**S. præcox** R.Br.

Down—Cultivated ground at Struell wells near Downpatrick, R.Ll.P., *B.N.F.C.* 1892-3.]

Arabis hirsuta (L.) R.Br.

Antrim—Tievebulliagh Mountain, S. A. Brenan.

Derry—Still plentiful in sandy fields and on sandhills at Magilligan, Mrs. Leebody, also R.Ll.P.

In Herb. D.M. is a note recording this plant from Cave Hill, Knockagh, and Torr Head, but we fear some mistake was made, as the plant has never been seen by any other botanist in these well-known places.

Cardamine amara L.

Down—Abundant at the "Witch Hole" on the Lagan at Glenmore near Lisburn, J. H. Davies; S.A.S., *I.N.* 1894.

Sisymbrium thalianum (L.) Gaud.

Antrim—Wall-tops about Larne, Herb.D.M. Cushendun, S. A. Brenan.

Derry—Near Derry City, Mrs Leebody. Magilligan and Castlerock, R.Ll.P.

S. alliaria L.

Down—Scarva Glen, H. W. Lett.

Antrim—Magheragall near Lisburn, and Altmore Glen, R.Ll.P.

[**Erysimum cheiranthoides** L.

Antrim—Wheat-field and roadside between Ballinderry and Lisburn, Herb. D.M.]

Sinapis alba L.

Down—Abundant in fields about Killowen, S. & P. Ardglass (R.Ll.P.), *B.N.F.C.* 1892-3.

Draba incana L.

Derry—Magilligan sandhills, small and not abundant, Mrs. Leebody, 1890. Abundant and fine on sand-dunes a mile N.E. of Magilligan railway station, R.Ll.P., 1894. Still occurs sparingly on Benevenagh cliffs.

D. verna L.

Down—Ballywalter and Ardglass, Templeton MSS. Saintfield, C.H.W.

Antrim—Roadside near Stoneyford, R.Ll.P.

Cochlearia danica L.

Down—Plentiful from Warrenpoint to Greencastle, and at Annalong, S. & P.

Antrim—On limestone rocks, White Park, Herb. D.M.

Derry—Portstewart, Mrs. Leebody. Common by the Bann from Coleraine to the sea, R.Ll.P.

[**Camelina sativa** L.

Down—Newtownards, E. F. Linton, 1871, Herb. F. J. Hanbury.

Antrim—Flax fields, Broughshane, Herb. Canon Grainger. Larne Curran, R.Ll.P.

Derry—Magilligan, Herb. D.M. Among flax above Garvagh, R.Ll.P.]

Thlaspi arvense L.

Down—Abundant in fields at Killowen, S. & P.

Lepidium campestre (L.) R. Br.

Down—Fields at Killowen, S. & P.

Antrim—Ram's Island, H.W.L.

L. Smithii (L.) Hook.

Antrim—Glenravel, R.Ll.P.

Derry—Kilrea and Garvagh, Mrs. Leebody.

Senebiera coronopus (Gaert.) Poir.

Down—Rostrevor, Killowen, Kilkeel, Annalong, S. & P.

[**S. didyma** Pers.

Down—Killough, C.H.W. Railway at Dundrum, S.A.S.

Antrim—Giant's Causeway, Miss Knowles.

Derry—Portstewart, Mrs. Leebody.

Apparently increasing in Ireland, and spreading northward.]

Cakile maritima Scop.

Antrim—Beach at Ballintoy, R. Brown; J. Britten, *Journ. Bot.* 1888, 285.

Raphanus raphanistrum L.

Down—Frequent in Mourne district, S. & P. Dundonald, Ballykinler, Dundrum, R.Ll.P.

Antrim—Frequent in cornfields through the county, Herb. D.M. Rathlin Island, R.Ll.P.

Derry—Upperlands, Kilrea, Garvagh, and Bann mouth, R.Ll.P.

R. maritimus Sm.

Down—Shore near Ballywalter, J. H. Davies, and plentiful from Killough to St. John's Point, S.A.S.; S.A.S., *I.N.* 1894. Cranfield coast-guard Station, S. & P.

RESEDACEÆ.

Reseda lutea L. Certainly naturalized at Ballycastle, and probably at Magheramorne also.

VIOLACEÆ.

Viola palustris L. To 1350 feet in the Mournes, S. & P.

Down—Frequent in the Mourne district, S. & P. Near Loughbrickland, H.W.L.

Antrim—Common on the hills and bogs; many stations might be given.

V. sylvatica Fries. Ascends to 2796 feet, Hart *R.I.A.*

V. canina L. To 500 feet in the Mournes, S. & P.

Down—Shores of Lough Island Reavy, Bryansford, and Bloody Bridge, S. & P. Ballywalter, C.H.W.

Antrim—Cushendun, Shoolbred *I.N.* Ram's Island, Bushfoot, Ballycastle. R.Ll.P.

Derry—Kilrea, Mrs. Leebody. Common about the Bann mouth, R.Ll.P.

V. lutea Huds., var. β **V. Curtisii** Forst.

Down—Margin of Castlewellan Lake, S. & P.

Antrim—Cushendun, Ballycastle, Bushfoot, R.Ll.P.

DROSERACEÆ.

Drosera rotundifolia L. To 1550 feet in the Mournes, Hart *R.I.A.* To 1450 feet there, S. & P.

D. intermedia Hayne.

Down—Pools by Kilkeel River at foot of Slieve Bingian, boggy ground by Colligan Bridge on the same stream, and in marshes S.W. of same place, S. & P.

The vague record in *Irish Flora* is thus verified. This station would appear to have been known to Templeton, who writes (MSS. Vol. A) "Drosera longifolia. Stalk scarcely longer than the leaves, capsule constantly three-valved; found in great abundance along with D. rotundifolia and D. anglica in the watery bog at the head of Kilkeel River, Mourne Mountains, August 9th, 1788." It must be noted that we did not find *D. anglica* there, or elsewhere in the district. In another note, after accurately describing *D. anglica*, Templeton writes "this is common on most of our bogs. *D. longifolia* I have not met with except on the watery bog at the head of Kilkeel River, Mourne Mountains."

D. anglica Huds.

Antrim—Slogan Bog near Randalstown, and near Tievebulliagh, Herb. D.M. Frocess near Glarryford, Miss Knowles. Abundant on bogs, both lowland and mountain, throughout northern Antrim, R.Ll.P.

Derry—In bogs near Newtownlimavady and Coleraine, R. Brown; J. Britten, *Journ. Bot.* 1888. Common on bogs near Kilrea and Garvagh, and on the margin of Lough Ouske in the Sperrin Mountains, R.Ll.P.

POLYGALACEÆ.

Polygala vulgaris L. To 2394 feet in the Mournes, S. & P.

var. β. **P. serpyllacea** Weihe. To 1720 feet in the Mournes, S. & P.

Down—In the Mournes, but not common, S. & P. Ballygowan, R.Ll.P.

Antrim—Common on the north Antrim coast, Shoolbred *I.N.*

var. γ **P. grandiflora** Bab.

Derry—Still sparingly on Benevenagh (R.Ll.P.) *B.N.F.C.* 1892-3.

ELATINACEÆ.

E. hydropiper L.

Down—Plentiful at the north end of Lough Brickland, H.W.L.; R.Ll.P., *B.N.F.C.* 1890-1.

The record "Near Belfast, Dr. Mateer" (*Flor. Ulst.*) turns out unexpectedly to be correct, as shown by a large series of fine specimens in the herbarium of the late Dr. Boswell, now in possession of Mr. F. J. Hanbury. The specimens, which have been examined by R.Ll.P., bear the label "Lagan Canal near h. tide w. mark, Co. Antrim. Coll. Augt, 1847, and comm. by Dr. Mateer," and they were, no doubt, intended for distribution through the Botanical Exchange Club. It appears improbable that the plant still survives in this station, as the water is now impure, and attempts to refind it have failed.

CARYOPHYLLACEÆ.

[**Saponaria officinalis** L.

Down—Bloody Bridge, S. & P. Mountstewart and Hillsborough, R.Ll.P.

Antrim—Portballantrae, R Ll.P.]

Silene anglica L.

Down—By the Annalong River, Hart *R.I.A.* Hilltown, S. & P.

Derry—Still abundant at Magilligan, Mrs. Leebody, and R.Ll.P.

S. inflata Smith.

Down—Frequent in the Mourne district, S. & P. Dundonald, Conlig Hill, Ballynahinch, R Ll.P.

Antrim—Shore of Lough Neagh at Shane's Castle, Herb. D.M. Rasharkin, R.Ll.P.

S. maritima With.

Down—Abundant on Conlig Hill, some miles from the sea, at 400-500 feet elevation, R.Ll.P.

S. noctiflora L.

Down—At Holywood, but only as a casual; not seen for some years on Rough Island; seems to be uncertain in its appearance, R.Ll.P.

[**S. dichotoma** Ehrh.

Down—Abundant in several corn-fields between Saintfield and Crossgar. D. Redmond, also C.H.W., 1894. A plant of southern Europe, introduced with seed, apparently not hitherto observed in Ireland.]

Lychnis vespertina Sibth.

Down—Fields between Downpatrick and Strangford, *B.N.F.C.*, 1893-4.

L. diurna Sibth.

Antrim—Plentiful about Cullybackey, Miss Knowles. Shane's Castle, R.Ll.P.

L. githago L.

Down—Maggie's Leap and Killowen, S. & P.

Derry—Fields at Bann mouth, R.Ll.P.

Sagina apetala L.

Down—Warrenpoint, S. & P. Comber, Saintfield, Tullymurry, and near Pointzpass, R.Ll.P.

Antrim—Whitehead, R.Ll.P.

Derry—Walls at Magilligan railway station, R.Ll.P.

S. ciliata Fries.

Down—Sandhills at Newcastle, S. & P.

S. maritima Don.

Down—Killowen and Newcastle, S. & P. Donaghadee and Mahee Island, R.Ll.P.

Antrim—Water-edge at Larne, R. Brown; J. Britten, *Journ. Bot.*, 1888. Portballantrae, R.Ll.P.

S. nodosa (L.) E. Meyer.

Down—Mouth of Causeway Water, S. & P. Victoria Park near Belfast, and at Killough, R.Ll.P.

Derry—Still frequent, as at Magilligan and Bann mouth, Mrs. Leebody, and R.Ll.P. Kilrea, R.Ll.P.

Arenaria verna L.

Antrim—Glenariff, Shoolbred *I.N.* Scawt Hill, R.Ll.P.

A. trinervia L.

Down—Rostrevor, and about Tollymore Park, S. & P.

Antrim—Glenarm, Herb. D.M. Ram's Island, H.W.L. Between Ballycastle and White Park (R.Ll.P.), *B.N.F.C.*, 1892-3.

Derry—Dungiven, and near Limavady, Mrs. Leebody.

A. serpyllifolia L.

Down—Rockport and Downpatrick, R.Ll.P.

Antrim—Cushendall, Herb. D.M. Near Antrim, D. Redmond. Whitehead, Cushendall, Bushfoot, R.Ll.P.

Stellaria uliginosa Murr. Ascends to 2450 feet, S. & P.

Cerastium triviale Link. var. β. **C. holosteoides** Fries.

Derry—Abundant in meadows on the south side of the Bann below the railway bridge at Coleraine, Mrs. Leebody. A rare variety, not hitherto found in Ireland.

C. tetrandrum Curtis.

Down—Rostrevor and Killowen, S. & P. Kirkiston, C.H.W. Rockport, R.Ll.P.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.*, 1889-90. Cushendun, R.Ll.P.

Derry—Benbradagh, Mrs. Leebody.

Spergularia rubra (L.) Pers.

Down—Abundant on the shores of Lough Island Reavy, S. & P.

S. salina Presl.

Derry—Near Limavady Junction, Mrs. Leebody.

Scleranthus annuus L.

Down—Frequent in the Mourne district, S. & P.

Derry—Near Kilrea, R.Ll.P.

MALVACEÆ.

Malva moschata L.

Down—Loughbrickland, H.W.L., *I.N.*, 1893. Tullyveery near Saintfield, C.H.W. Between Dundonald and Comber, and near Tullymurry, R.Ll.P.

Antrim—Shane's Castle deer-park, Herb. D.M.

M. rotundifolia L.

Down—Frequent from Killowen to Seafield, S. & P.

Lavatera arborea L.

Antrim—"On the Shore at Ballantoy and grows also in the Sheep Island about ½ mile from the Ballantoy shore; Sept., 1797," R. Brown. Still grows on Sheep Island, S. A. Brenan. Summit of Stackaniskan, an isolated sea-stack at western end of Rathlin Island, R.Ll.P., *I.N.*, 1893.

We have no doubt that the plant is truly wild in these inaccessible maritime situations.

HYPERICACEÆ.

Hypericum androsæmum L.

Antrim—Cullybackey, Miss Knowles. Magheragall near Lisburn, Cairncastle, Cushendall, Fair Head, R.Ll.P.

Derry—Maghera, Kilrea, and Garvagh, R.Ll.P.

H. perforatum L.

Down—Near Newry, H.W.L. Tullymurry, R.Ll.P.

Antrim—Ram's Island, R.Ll.P.

Derry—Eglinton, Mrs. Leebody. Kilrea, R.Ll.P.

H. quadrangulum L. (Ex. p.). var. β **H. maculatum** Bab.

Down—By the Lagan Canal two miles above Lisburn, Richd. Hanna. Abundant by the Lagan Canal close to Lough Neagh, H.W.L. and C.H.W. Near Marino railway station, R.Ll.P.

Antrim—Glenmore near Lisburn (J. H. Davies), *B.N.F.C.* 1892-3.

H. humifusum L. To 800 feet in the Mournes, S. & P.

Down—Frequent in the Mournes, S. & P. Scrabo and Ballynahinch, R.Ll.P.

H. pulchrum L. To 2000 feet in the Mournes, S. & P.

H. elodes Huds. To 650 feet in the Mournes, S. & P.

Down—Several stations near Bryansford, Castlewellan, and Kilkeel, S. & P.

Derry—Ballyarnott race-course, Mrs. Leebody; S.A.S., *I.N.* 1894.

GERANIACEÆ.

[**Geranium striatum** L.

Down—Abundant in a lane near Comber, R.Ll.P.

Antrim—Near Ballinderry, W. D. Donnan.]

G. sylvaticum L. R.Ll.P. considers that Marino, where this plant grew (but suspiciously near a garden) until some ten years ago, was probably the "Holywood" station of *Flor. Ulst.*

The localities "Glenarm deerpark, and glen above Milltown at Cairncastle," given in *Flor. N.E.I.* for *G. pratense*, belong to *G. sylvaticum*. The range of these two plants in Antrim (and in Ireland) is thus seen to be very limited and well-defined, *G. sylvaticum* being confined to a few square miles in the vicinity of Glenarm, on the east coast of Antrim, while *G. pratense* is found along the north coast from Portrush to Ballycastle, a distance of some twenty miles.

G. pratense L. First found in Ireland by Templeton, not by Moore, as stated in *Flor. N.E.I.*

The Glenarm and Cairncastle stations of *Flora* are transferred to *G. sylvaticum*.

G. perenne Huds.

Down—Roadside near Castle Espie, C.H.W.

Antrim—Roadside near Whitewell quarries on Cave Hill, W. D. Donnan; R.Ll.P., *B.N.F.C.* 1892-3.

G. lucidum L.

Antrim—Torr Head, Herb. D.M. Glenariff, Shoolbred *I.N.* Antrim, W. S. Smith. Scawt Hill, and lake-shore west of Shane's Castle, R.Ll.P.

Erodium cicutarium L'Herit. 0—1200 feet.

Down—Abundant on the Mourne coast-line; also at Bryansford and Castlewellan, 2 and 4 miles from the sea, S. & P. Holywood Hills, in fields at 400 feet, R.Ll.P.

Antrim—Larne, Cushendun, White Park Bay, R.Ll.P.

Derry—Summit and base of Benevenagh cliffs, *B.N.F.C.* 1892-3. The plant grows here at an elevation of 800—1200 feet, associated with *Silene acaulis*, *S. maritima*, *Dryas octopetala*, *Salix herbacea*, and other alpines.

E. moschatum L'Herit.

Down—Annalong, Hart *R.I.A.*; and subsequently, S. & P. Waste ground south of Killough, Richd. Hanna; S.A.S., *I.N.* 1894.

Robert Brown, in the MS. referred to in the Introduction, notes this species as "growing abundantly at the west end of the suburbs of Londonderry, Sept. 29th, 1795," and "near Carrickfergus, July, 1797." It has not been found in either of these stations by any recent observer, and it seems probable that *E. cicutarium* was the plant seen.

E. maritimum L'Herit.

Down—Abundant at Ballykinler, R.Ll.P. Still at Kirkiston, C.H.W.

LINACEÆ.

Radiola linoides (L.) Gmel.

Down—Several places between Newcastle and Annalong, and at Causeway Water, S. & P.

Antrim—Abundant on Bushfoot sandhills, R.Ll.P.

CELASTRACEÆ.

Euonymus europæus L.

Down—Warrenpoint, Annalong, Newcastle, S. & P. Lough Leagh and Castle Espie, C.H.W. Near Ballynahinch, Richd. Hanna. Near Hillsborough, S.A.S. Clough and Killyleagh, R.Ll.P.

Antrim—Muckamore Glen (R.Ll.P.) *B.N.F.C.* 1893-4. Cullybackey, Miss Knowles. Rasharkin, S. A. Brenan.

RHAMNACEÆ.

Rhamnus catharticus L.

Antrim—Abundant on the shore of Lough Neagh at the place called the Selchin, Parish of Glenavy, Herb. D.M. This is another Lough Neagh record of a shrub that seems now quite lost through drainage.

Templeton notes this plant (MSS.) "in a hedge about 2 miles beyond Carrickfergus, June 30th, 1804." It may have been planted there, as it was formerly a notable plant, being much used medicinally. It has not been found there since.

R. frangula L.

Antrim—Bushy places near the River Main in Shane's Castle Park, Prof. R. O. Cunningham; R.Ll.P., *B.N.F.C.* 1890-1. The only recent record of this species.

LEGUMINOSÆ.

Ulex europæus L. Rises in the Mournes to 820 feet, Hart *R.I.A.*; to 800 feet, S. & P.

U. Gallii Planch. Upper limit in the Mournes 1600 feet, Hart *R.I.A.*; 1500 feet, S. & P.; at 1650 feet on Slieve Bearnagh, R.Ll.P.

Down—Aghaderg parish, H.W.L.

Sarothamnus scoparius L. To 800 feet in the Mournes, S. & P.

Ononis repens L.

Down—Sands east of Cranfield Point, S. & P. Margin of Lough Leagh (R.Ll.P.), *B.N.F.C.* 1891-2. Field at Loughbrickland, H.W.L.

Derry—Benone at Magilligan, sparingly, Mrs. Leebody.

var. **β horrida** Lange.

Down—Sandy shore at Ardglass, C.H.W.

O. spinosa L. has not been re-found in Co. Down, and was, no doubt, a casual, S.A.S.

Medicago lupulina L.

Down—Common in the Mourne district, S. & P. Conlig, Ballykinler, Tullymurry, Killowen, R.Ll.P.

Antrim—Ballycastle, Redbay, Shane's Castle, Portmore, Whitehead, Cave Hill, R.Ll.P.

[**M. sativa** L.

Down—Fields at Cultra and Craigavad, R.Ll.P.]

[**Melilotus officinalis** Willd.

Antrim—Glenariff, Shoolbred *I.N.*]

M. arvensis W.

Antrim—Still abundant at several places between Kilroot and Larne, as it has been for the last 25 years, and may fairly be considered naturalized here.

[**M. parviflorus** Lam.

Antrim – Waste ground, Duncrue St., Belfast, R.Ll.P.]

Trifolium medium L.

Antrim—Throughout the county; many localities might be added.

Derry – Railway banks between Coleraine and Castlerock, R.Ll.P.

T. arvense L.

Down—Ballykinler sands, R.Ll.P.

Antrim—Carrickfergus, Cushendall, Ballycastle, Herb. D.M.

T. hybridum L. Frequent in sandy cultivated fields and waste ground, and thoroughly established as a colonist, S.A.S., *I.N.*, 1894.

Down and Antrim—Frequent.

Derry – Kilrea, and sandy fields at Bann mouth, R.Ll.P.

[**T. resupinatum** L.

Down – Saintfield, C.H.W.]

T. procumbens L.

Down—Frequent in Mourne district, S. & P. Shore-line below Holywood, and Ballykinler, R.Ll.P.

Antrim – Cushendall, Herb. D.M. Glenarm, R.Ll.P.

Derry—Eglinton, Mrs. Leebody.

Lotus corniculatus L. To 1200 feet in the Mournes, S. & P.

var. γ **L. crassifolius** Pers.

Derry—Rosses Bay on the Foyle, Mrs. Leebody.

L. pilosus Beeke. To 1150 feet in the Mournes, S. & P.

Down—Magheralin and Saintfield, C.H.W. Loughinisland, R.Ll.P.

Antrim—Glenariff, Shoolbred *I.N.* Ballymena, and plentiful at Racavan, Miss Knowles. Cushendun, S.A. Brenan. Mazetown, and Cairncastle, S.A.S. Rasharkin, R.Ll.P.

Derry—Frequent in North Derry, Mrs. Leebody. Kilrea, Garvagh, Maghera, and Coleraine, R.Ll.P.

Vica sylvatica L.

Down—Banks by the sea near Bloody Bridge, but not found elsewhere in Mourne district, S. & P. In a quarry by the railway north of Dundrum, plentiful, R.Ll.P.

Antrim—A var. with pure white flowers on limestone rocks between Larne and Glynn, Herb. D.M. Upper part of Colin Glen, and by the railway between Lambeg and Dunmurry, J. H. Davies. Glenariff, Shoolbred *I.N.* Altmore and Culraney, R.Ll.P.

V. orobus (L.) DC. Not found at Rostrevor (see *Raii Syn.* ed. II and *Flora N.E.I.*) by S. & P. Sherard's plant may have been *V. sylvatica*, which Templeton found there. The specimens in the Sherardian herbarium at Oxford do not settle the question.

V. sepium L. A white-flowered variety grows about Glenmore near Lisburn (J. H. Davies) and at Marino (R.Ll.P).

V. angustifolia Roth.

Down—Frequent in Mourne district, S. & P. Kirkiston, C.H.W. Greypoint and Killyleagh, R.Ll.P.

Antrim—Ballycastle and Cushendun, Herb. D.M. Whitehead and Rasharkin, R.Ll.P.

V. lathyroides L.

Down—Ballymacormick Point, R.Ll.P.

Antrim—Cushendun, S. A. Brenan.

Derry—Still at Magilligan, Mrs. Leebody.

Lathyrus macrorrhizus Wimm. To 1,000 feet in the Mournes, S. & P.

var. β. **L. tenuifolius** Roth.

Down—Rostrevor, S & P.

ROSACEÆ.

Prunus communis L. To 1,000 feet in the Mournes, S. & P.

P. insititia L. May fairly be considered as naturalized in the district.

P. padus L.

Antrim—Refound in Glenshesk, Shoolbred *I.N.*

P. avium L.

Derry—Walworth Wood near Londonderry, Mrs Leebody.

P. cerasus L.

Down—Crawfordsburn, Clandeboye demesne, and Annalong, R.Ll.P., *B.N.F.C.* 1890-1. Near Crossgar and Downpatrick, R.Ll.P., *B.N.F.C.* 1892-3.

Antrim—Near Carnmoney church, planted, S.A.S. Ballycastle, R.Ll.P., *B.N.F.C.* 1892-3. Glendun, and Rasharkin, R.Ll.P.

Derry—Near Draperstown, R.Ll.P., *B.N.F.C.* 1892-3.

Not unfrequent, and although no doubt planted in some of its stations, in others appears naturalized.

Sanguisorba officinalis L.

Down—Refound near Donaghadee, growing abundantly and luxuriantly on a railway bank, J H. Davies; S.A.S., *I.N.* 1894.

Poterium sanguisorba L.

Antrim—Abundant in a meadow at Glenmore near Lisburn, J. H. Davies, *I.N.* 1892. The late Mr. More inclined to the view that it had been introduced in this station. It has continued abundant during the three years it has been under observation, but is apparently confined to one meadow. The geological formation is New Red Sandstone, but the Chalk is not far away.

Agrimonia eupatoria L.

Down—Killowen, S. & P. Anadroghal near Lough Neagh, H.W.L. and C.H.W. Near Greypoint, Ballykinler, and Tullymurry, R.Ll.P.

Antrim—Very frequent.

Derry—Kilrea and Magilligan, Mrs. Leebody.

A. odorata Mill.

Down—Roadside near Steamboat quay, Downpatrick, R.Ll.P., *B.N.F.C.* 1892-3.

Antrim—Glendun, Shoolbred *I.N.*

Alchemilla vulgaris L. To 1500 feet in the Mournes, S. & P.

var β **A. minor** Huds.

Down—Scrabo Hill, R.Ll.P.

Antrim—Binnagee near Carnlough, W. D. Donnan. Knockagh and Dunloy, R.Ll.P.

The recent paper by Rev. E. F. Linton on British forms of *Alchemilla vulgaris* (*Journ. Bot.*, April, 1895), and an examination of local specimens kindly made by that botanist, show that the above nomenclature needs revision. What was treated as type in *Flora* should now be quoted as var. *A. alpestris* Schmidt; it is common in our district. The var. *A. minor* of *Flora* must now

be called var. *A. flicaulis* Buser; it is frequent on the basaltic plateau of Antrim and Derry. Restricted *A. vulgaris* L. (=*A. pratensis* Schmidt) probably occurs in our district also, but has not yet been separated.

Potentilla reptans L.

Down—Rostrevor, Killowen, and Newcastle, S. & P. Holywood and Millisle, R.Ll.P.

Antrim—Carrickfergus Junction, R.Ll.P.

P. tormentilla Sibth. var. β **P. procumbens** Sibth.

Down—Rostrevor and Newcastle, S. & P. Marino, R.Ll.P.; S.A.S., *I.N.* 1894.

Antrim—Glenariff, Glendun, and Glensheak, Shoolbred *I.N.* Area in front of Belfast Museum, S.A.S., *I.N.* 1894.

Derry—Sandy fields at Bann mouth, and frequent in Kilrea district, R.Ll.P.

P. procumbens x tormentilla (*P. suberecta* Zimmeter).

Down—Newtownbreda, 1849, Dr. Mateer; E. S. Marshall, *Journ. Bot.* 1894, and W. H. Purchas, *ibid.*

Antrim—Glensheak (*fide* Marshall), Shoolbred *I.N.*

Rubus idæus L. To 1,400 feet in the Mournes, S. & P.

R. suberectus Anders.

Down—Margin of Castlewellan Lake, S.A.S., *B.E.C. Report* 1893. This is the plant which is recorded as *R. ammobius* by S. & P., on the authority of Prof. Babington. Dr. Focke, the describer of the latter species, has examined our plant, and places it under *R. suberectus*.

R. plicatus W. & N.

Down—Aughnadarragh near Saintfield, C.H.W.

R. Rogersii Linton.

Down—Old bog in Saintfield demesne, and boggy ground by Aughnadarragh Lake near Saintfield, C.H.W.

R. nitidus W. & N.

Down—Margin of Altnadua Lake, S. & P. (as var. *hamulosus*, which Mr. Rogers remarks appears to be exactly typical *nitidus*).

R. carpinifolius W. & N.

Down—Newcastle and Moygannon Glen, S. & P. Loughbrickland, H.W.L.

R. Lindleianus Lees.

Down—Two stations in Aghaderg parish, H.W.L.

Antrim—Glenariff and Glendun, Shoolbred *I.N.*

Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. erythrinus Genev.

Derry—Ballinderry, S. A. Brenan, *Journ Bot.* 1895.

R. rhamnifolius W. & N. (Sp. collect.)

Down—Between Belfast and Holywood, J. Ball; W. O. Focke, *Journ. Bot.* 1891. Between Ballyvarley and Gilford, H.W.L. Castlewellan Park, S.A.S.

Antrim—Glenariff and Glendun, Shoolbred *I.N.* Cairncastle, S.A.S.

Derry—Magilligan, J. Ball; W. O. Focke, *Journ. Bot.* 1891.

S. A. Brenan's Ballinderry record in *Journ. Bot.* 1895 is doubtful.

R. nemoralis P. J. Muell. (Genev. *non* Bab.)

Down—By the White water at Donard Lodge, S. & P. (as *R. macrophyllus* var. *umbrosus* Arr.)

var. b. **glabratus** Bab.

Down—By Ghann River, S. & P. (as *R. macrophyllus* var. *glabratus* Bab.)

R. pulcherrimus Neum.

Down—Lisdalgan near Saintfield, C.H.W.; S.A.S., *I.N.* 1894. Ballintaggart in Aghaderg parish, H.W.L. By Castlewellan Lake, S.A.S.

Antrim—Cave Hill, Glenariff, Glendun, and between Cushendall and Knocknacarry, Shoolbred *I.N.*

Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. Muenteri Marss.

Antrim—Colin Glen, J. Ball; W. O. Focke, *Journ. Bot.* 1891.

Mr. Rogers considers that this form cannot as yet be included in British lists.

R. villicaulis Koehl.

Antrim—Glenariff and Glendun, Shoolbred *I.N.*

Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

var. b. **Selmeri** (Lindeb.)

Down—Saintfield, C.H.W., *I.N.* 1894. Between Scarva and Gilford, and at Dromorebreague in Aghaderg parish, H.W.L. Drumcro near Magheralin, C.H.W.

Antrim—Glendun, Shoolbred *I.N.*
Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. gratus Focke.
Antrim—Glendun, H.W.L.
Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. pubescens Weihe. (Sp. collect.)
Down—Carrickmannan near Saintfield, C.H.W.

R. silvaticus W. & N.
Down—Between Milltown and Clonallen, H.W.L. Saintfield, C.H.W.

R. macrophyllus W. & N.
Down—White Water, Altnadua Lake, and Tollymore Park, S. & P. Saintfield, C.H.W. Aghaderg parish and Hillsborough, H.W.L.
Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

var. b. **R. Schlechtendalii** (Weihe).
Down—Moygannon Glen, S. & P. Saintfield, C.H.W. Loughbrickland, H.W.L.

R. micans Gren. and Godr.
Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. pyramidalis Kalt.
Down—Tollymore Park and Donard Lodge, S. & P. Saintfield, C.H.W.
Antrim—Glenariff, Shoolbred *I.N.*

R. leucostachys Schleich.
Antrim—Cave Hill, near Larne, Glenariff, Shoolbred *I.N.*
Derry—Ballinderry, S A. Brenan, *Journ. Bot.* 1895.

R. mucronatus Blox.
Down—Saintfield, C.H.W.

R. Gelertii Frider var. b. **eriniger** Linton.
Down—Aghaderg glebe at Loughbrickland, H.W.L.

R. Leyanus Rogers.
Down—Saintfield, C.H.W.; *Watson B.E.C.* 1893-4 (as *R. Drejeri*). "Very strong, and differing from the ordinary English plant."—W. M. Rogers.

R. radula Weihe.

Down—Aghaderg glebe at Loughbrickland, H.W.L.

Antrim—Hedgerows near Larne, Shoolbred *I.N.*

Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. echinatus Lindl.

Antrim—Cave Hill, Glenariff, Glendun, Shoolbred *I.N.*

R. rudis W. & N.

Down—Aghaderg glebe at Loughbrickland, H.W.L. "Hardly typical," W. M. Rogers.

R. scaber W. & N.

Down—Aghaderg glebe at Loughbrickland, H.W.L. S. A. Brenan's Ballinderry record in *Journ. Bot.* 1895 is omitted as doubtful.

R. fuscus W. & N.

Down—Two stations in Aghaderg parish, H.W.L.

R. rosaceus W. & N.

Down—Near Maralin, H.W.L. ("var. near *infecundus*," W. M. Rogers.)

var. b. **R. hystrix** (W. & N.)

Antrim—Glenariff, Shoolbred *I.N.*

R. Kochleri W. & N.

Down—Newcastle, S. & P.

Antrim—Glenariff and Glendun, Shoolbred *I.N.*

var. b. **R. pallidus** Bab.

Down—Tollymore Park, S. & P. Saintfield, C.H.W; S.A.S., *I.N.* 1894. Near Scarva and at Loughbrickland, H.W.L.

R. hirtus W. & K. var. c. **R. Kaltenbachii** Metsch.

Down—Ballintaggart in Aghaderg parish, H.W.L.

R. dumetorum W. & N.

Antrim—Cave Hill, and near Larne, Shoolbred *I.N.* Glendun, S. A. Brenan, *Journ. Bot.* 1895.

var. b. **R. diversifolius** (Lindl.)

Down—In Aghaderg parish, H.W.L.

R. corylifolius Sm. Ascends to 1400 feet in the Mournes, S. & P.

a. **R. sublustris** (Lees.) Common. Many localities might be added.

var. b. **R. conjungens** (Bab.)

Antrim—Near Larne, Shoolbred *I.N.*

R saxatilis L. 800-2000 feet in the Mournes, S. & P.

Down—Frequent on the Mourne Mountains, S. & P.

Antrim—Knockagh, in fine fruit (R.Ll.P.), *B.N.F.C.* 1892-3.

Derry—Heathy places near Kilrea, R.Ll.P.

R. chamæmorus L.

Derry—A small patch on the Derry side of the county boundary on the west side of Dart Mountain, H. C. Hart, *Journ. Bot.* 1892, and Hart and Barrington, *I.N.* 1892. A most interesting confirmation of Prof. Murphy's record (*Flora Hibernica*).

Geum intermedium Ehr.

Antrim—Near Muckamore, (R.Ll.P.), B.N.F.C. Excursion; *I.N.* 1893.

G. rivale L.

Down—Decidedly rare in the county. Absent from the Mourne district, S. & P. Only observed in the glen at Holywood Waterworks, R.Ll.P.

Rosa spinosissima L. To 2000 feet in the Mournes—a remarkable elevation, S. & P.

var. **R. ciphiana** Sibbald.

Derry—Magilligan, Mrs. Leebody.

R. hibernica Sm. var. b. **glabra**, Baker.

Down—Tillysburn, S.A.S. M. Crepin places the Tillysburn plant under this variety, adding "un peu pubescente." He considers *R hibernicą* a hybrid—*R. pimpinellifolia* x *canina* = *spinosissima* x *canina*.

[**R. pomifera** Herm.

Antrim—Woods in Shane's Castle Park, S.A.S.]

R. involuta Sm.

Down—Mountain roads about Hilltown (aggregate), S. & P.

Antrim—Glendun ("form," W. M. Rogers), S. A. Brenan. Top of Colin Glen, *Flora Belfastiensis* (*R. Sabini*). This record was considered doubtful, but a specimen gathered there by S.A.S. in 1894 has been identified by M. Crepin.

var. *R. Sabini* Woods. The Braid Valley plant recorded in *I.N.*, 1894, p. 221 is not *R. Sabini*; nor can we be quite sure of the Hilltown plant of S. & P.

R. mollissima Willd.

Down—Near Dundrum, by the Quoile at Downpatrick, and at Ballynahinch, S.A.S.

Antrim—Waterloo near Larne (R.Ll.P.), *B.N.F.C.* 1890-1. Glendun and Glensheak, Shoolbred *I.N.* Rasharkin, and between Ballymena and Broughshane, R.Ll.P.

Derry—Common near Kilrea weir, R.Ll.P.

R. tomentosa Smith. To 980 feet in the Mournes, S. & P.

var. d. **scabriuscula** Sm.

Antrim—Near Cushendall, Shoolbred *I.N.*

R. rubiginosa L.

Down—Hilltown, S.A.S. Near Comber and Downpatrick, R.Ll.P.

Antrim—Shane's Castle, Ram's Island, Dervock, Rasharkin, R.Ll.P.

Derry—Frequent in North Derry, Mrs. Leebody. Portglenone, R.Ll.P.

R. micrantha Smith. This species must be deleted from our flora. The Cushendun plant has been finally decided to be *R. rubiginosa*.

R. canina L., var. a. **lutetiana** (Leman).

Down—Comber, S.A.S.

Antrim—Common in the glens, Shoolbred *I.N.* Larne and Cairncastle, S.A.S.

var. e. **dumalis** (Bechst.)

Antrim—Common in the glens, Shoolbred *I.N.* Crumlin, Ballygilbert north of Cairncastle, and near Belfast, S.A.S.

var. j. **dumetorum** (Thuill.)

Down—Killowen, S.A.S.

Antrim—Mazetown, S.A.S.

var. n. **tomentella** (Leman).

Antrim—Colin Glen and Crow Glen, S.A.S.

var. w. **suberistata** Baker.

Antrim—Glendun, and sandy ground by the river in Glensheak, Shoolbred *I.N.*

R. glauca Vill.

Antrim—Near Belfast, and Waterloo near Larne, S.A.S. Determined by M. Crepin.

R. arvensis Huds.

Down—South of Rostrevor, and near Bloody Bridge, S. & P. Between Crossgar and Killyleagh (R.Ll.P.), *B.N.F.C.* 1891-2. Rademon, Kilmore near Crossgar, and Saintfield, C.H.W. Loughinisland, R.Ll.P.

Antrim—Near Ballinderry, R.Ll.P.

var. c. **bibracteata** (Bast.).

Antrim—Hedgerow near Cushendun, Shoolbred *I.N.*

Crataegus oxyacantha L. To 1000 feet in the Mournes, S. & P.

Pyrus malus L.

Down—Frequent in Mourne district, doubtfully native, S. & P.

Antrim—Frequent about Stoneyford, R.Ll.P.

Derry—Bond's Glen, Mrs. Leebody. Upperlands and Kilrea, R.Ll.P.

P. aucuparia Gaert.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-90.

P. aria (L.) Sm.

Antrim—Glendun, 1868, S. A. Brenan (type! S.A.S.).

The specimen in Dr. Moore's Derry collection appears to be *P. rupicola*.

LYTHRACEÆ.

Peplis portula L. To 1150 feet in the Mournes, S. & P.

Down—Throughout the Mourne district, S. & P. Loughbrickland, H.W.L. Dundonald, R.Ll.P.

Derry—Enagh Lough, Mrs. Leebody.

ONAGRACEÆ.

Epilobium angustifolium L. To 1500 feet in the Mournes, S. & P.

Down—Cliffs of Eagle mountain, and cliffs south of Blue Lough, S. & P.

Antrim—Gobbins cliffs (R.Ll.P.), *B.N.F.C.* 1892-3. Scawt Hill, Carnlough, Parkmore, Altmore, Culraney, Dunseverick, R.Ll.P.

E. obscurum x palustre.

Antrim—Glenariff, Glenshesk, and Giant's Causeway, Shoolbred *I.N.* (*teste* E. S. Marshall).

E. palustre L. To 1150 feet in the Mournes, S. & P.

Down—Frequent in the Mourne district, S. & P. Sydenham, Dundonald, Conlig, Ballynahinch, and Narrow-water, R.Ll.P.

Antrim—Glenariff, Glendun, Fair Head, Shoolbred *I.N.* Bog Meadows, Killagan, Lough Naroon, Bushfoot, R.Ll.P.

Derry—Kilrea, Bannmouth, and Magilligan, R.Ll.P.

Circæa alpina L.

Down—Tollymore Park, S. & P.

Antrim—Langford Lodge, and still in Glenariff, R.Ll.P.

Derry—By the Roe near Limavady, Mrs. Leebody.

In addition to its native mountain habitats, it occurs frequently about Belfast as a garden weed—and a troublesome one too—as at Windsor Avenue, Cliftonville, several gardens at Holywood, and Clandeboye, R.Ll.P.

var. **β C. intermedia** Ehr.

Down—As a weed in a garden at Holywood, R.Ll.P.

Antrim—Glenariff and Glenshesk, Shoolbred *I.N.* Glendun, R.Ll.P.

HALORAGACEÆ.

Myriophyllum spicatum L.

Down—Abundant in Clandeboye Lakes, R.Ll.P.

Antrim—Abundant in Portmore Lough, R.Ll.P.

Derry and Antrim—In Lough Neagh at Toome, abundant in Lough Beg, and thence down the Bann to the sea, R.Ll.P.

Hippuris vulgaris L.

Down—Altnadua and Moneyscalp, S. & P. Pollramer Lake near Crossgar, C.H.W. Loughinisland and Killinchy, R.Ll.P.

Antrim—Between Ballycastle and White Park (R.Ll.P.), *B.N.F.C.* 1892-3. Portmore, H.W.L. Bog north of Ballymoney, R.Ll.P.

Derry—Bann mouth, R.Ll.P.

PORTULACEÆ.

Montia fontana L. To 2450 feet in the Mournes, S. & P.

CRASSULACEÆ.

Sedum rhodiola DC. 1000—2000 feet in the Mournes, S. & P.

Down—Pigeon Rock Mountain, and along the Slieve Muck ridge, S. & P.

Antrim—Abundant on the coast north of Torr, R.Ll.P.

S. telephium L.

Down—Dromantine, H.W.L. and C.H.W. Holywood Hills, Ballygowan, Downpatrick, R.Ll.P.

Antrim - Ballyclose and Craigbilly, Miss Knowles.

Derry—Near Maghera, R.Ll.P.

S. anglicum Huds. To 1000 feet in the Mournes, S. & P.

SAXIFRAGACEÆ.

Saxifraga stellaris L. To 2350 feet in the Mournes, Hart *R.I.A.*

Down—Not abundant on the Mournes, as stated by Templeton. It is abundant on the N.W. slopes of Donard and Commedagh, but elsewhere it was seen by S. & P. only sparingly on Cove Mountain and at Hare's Gap.

S. hypnoides L.

Derry—Benbradagh, Mrs. Leebody.

S. tridactylites L.

Down—On walls and gravel at Kilmore near Crossgar, and on rocks by the coast at Cloughey Bay, C.H.W.

Derry—Bellarena, Mrs. Leebody.

Chrysosplenium oppositifolium L. To 2450 feet in the Mournes, S. & P.

Parnassia palustris L.

Antrim—Roadside near Drumnasole, *B.N.F.C.* 1890-1. Carnlough, Altmore, Kinbane Head, R.Ll.P.

Derry—Mouth of the Roe, R.Ll.P.

UMBELLIFERÆ.

Hydrocotyle vulgaris L. To 1500 feet in the Mournes, S. & P.

Sanicula europæa L. To 1500 feet in the Mournes, S. & P.

Eryngium maritimum L.

Down—Very abundant from Greencastle Point to Nicholson's Point, S. & P.

Cicuta virosa L.

Down—By the Canal near Goraghwood, R.Ll.P.

Apium graveolans L.

Antrim—Redbay, Miss Knowles Still occurs both north and south of Carrickfergus, S.A.S.

A. nodiflorum (L) Reich. var. β *A. repens* (L.). Not now known in district 12, and was probably a misnomer.

A. inundatum Reich.

Down—Near Warrenpoint and Kilkeel, S. & P. Magheralin, and Pollramer Lake near Crossgar, C.H.W. Killinchy, Ballynahinch, Ballykinler, R.Ll P.

Antrim—Gawley's Gate on Lough Neagh, and by the Bann occasionally, R.Ll.P.

Derry—Lakes at Kilrea, and along the course of the Bann, R.Ll.P.

var. **Moorei** Syme.

Down—Marsh at Saul near Downpatrick, R.Ll.P.

Derry—By the Bann three miles below Kilrea, R.Ll.P.

Carum verticillatum Koch.

Antrim—The Crumlin record must be expunged; S.A.S is satisfied that it was an error.

Derry—It is immensely abundant at its Coleraine station, and extends down the Bann to the sandhills of the coast.

It cannot be found near Belfast, and the present range in our district of this rare Irish plant is thus seen to be very restricted, being confined to the meadows bordering the tidal portion of the Bann, and the headlands at Giant's Causeway.

[**C. carui** L.

Down—Holywood, R.Ll.P.

Antrim—Cushendun, S. A. Brenan. Carnlough, Portballantrae, Causeway, and on roadsides and heaths on Rathlin Island, R.Ll.P.]

[**Petroselinum sativum** Hoffm.

Down—Reagh Island in Strangford Lough, C.H.W. Walls of old castle at Ringhaddy, R.Ll.P.]

Pimpinella saxifraga L.

Antrim—Near Broughshane, Miss Knowles. Antrim and Rasharkin, R.Ll.P.

Sium erectum Huds.

Down—At a number of places near Downpatrick, and in Carrigullion Lake near Killinchy, R.Ll.P., *B.N.F.C.* 1892-3.

Œnanthe fistulosa L.

Antrim—Shores of Lough Beg, and thence to Coleraine occasionally, R.Ll.P.

Derry—Enagh Lough, Mrs. Leebody.

Œ. Lachenalii Gmel.

Down—Killowen, and mouth of Causeway water, S. & P.

Antrim—Shore at Giant's Causeway, R.Ll.P.

Œ. phellandrium L.

Down—Lough Leagh (R.Ll.P.), *B.N.F.C.* 1891-2. Shore of Lough Neagh, C.H.W. Portavoe, Quoile River, Money Lake, R.Ll.P.

Derry—Magilligan, Mrs. Leebody.

Æthusa cynapium L.

Down—Warrenpoint, Rostrevor, and abundant at Killowen, S. & P. Saul, R.Ll.P.

Antrim—Brown's Bay on Islandmagee (R.Ll.P.) *B.N.F.C.* 1892-3. Crumlin Waterfoot, Miss Knowles. About Belfast, Whitehead, and Larne, R.Ll.P.

Derry—Coleraine, Mrs. Leebody. Upperlands. R.Ll.P.

Ligusticum scoticum L.

Antrim—Rocks on the shore at Bushfoot, R.Ll.P., and recently refound at Garron Point, S. A. Brenan; R.Ll.P., *B.N.F.C.* 1892-3.

Derry—Sparingly at Downhill, and still plentiful between Portrush and Portstewart, Mrs. Leebody.

Silaus pratensis (L.) Bess. Has not been refound, and was no doubt a casual.

Angelica sylvestris L. To 1500 feet in the Mournes, S. & P.

[**Peucedanum ostruthium** Koch.

Antrim—Stoneyford, R.Ll.P. Not now on Cave Hill, S.A.S.

Derry—Downhill, Mrs. Leebody.]

Pastinaca sativa L.

Down—Holywood and Dundrum, probably casual, R.Ll.P.

Antrim—By the new path to Cave Hill, casual, S.A.S.

Derry—Still abundant at Magilligan, and quite naturalized, R.Ll.P.

Heracleum sphondylium L. To 1,500 feet in the Mournes, S. & P.

Torilis nodosa (Huds.) Gaert.

Down—Abundant near Killowen, S. & P. Whiterock near Killinchy, C.H.W.

Antrim—Rathlin Island, R.Ll.P., *I.N.* 1893.

Scandix pecten-veneris L.

Down—Abundant at Killowen, S. & P. Killinchy (R.Ll.P.), *B.N.F.C.* 1890-1. Lough Leagh (R.Ll.P.), *B.N.F.C.* 1891-2. Craigavad, Downpatrick, R.Ll.P.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-0. Carnlough, Dunseverick, Carrick-a-rede, Portballantrae, R.Ll.P.

Derry—Magilligan, Mrs. Leebody.

Chaerophyllum anthriscus Lam.

Down—Killinchy (R.Ll.P.), *B.N.F.C.* 1890-1. Seashore at Ballyhornan Bay, very luxuriant, R.Ll.P.

Antrim—Still on the Curran at Larne, R.Ll.P.

Myrrhis odorata L.

Down—Roadside south of Spelga, S. & P. Near Saintfield and Kearney's Point, C.H.W. Loughbrickland and Annaclone, H.W.L. Holywood Hills, Crawfordsburn, &c., R.Ll.P.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-90. Glendun, S. A. Brenan. Donegore, Dunadry, Stoneyford, Torr, Dunseverick, Giant's Causeway, R.Ll.P.

Conium maculatum L.

Antrim—At Portmore; rare inland, R.Ll.P.

Smyrnium olusatrum L.

Down—Frequent in Mourne district, S. & P. Knock and Downpatrick, R.Ll.P.

Antrim—Near Antrim, R.Ll.P.

Derry—Frequent in North Derry, Mrs. Leebody.

HEDERACEÆ.

Hedera helix L. To 2000 feet in the Mournes, S. & P.

CAPRIFOLIACEÆ

Sambucus ebulus L.

Down—Near Donaghmore, H.W.L. Near Ballynahinch, and still at Holywood, R.Ll.P.

Antrim—Dunadry and Cushendall, R.Ll.P.

Viburnum opulus L.

Down—Rostrevor, Altnadua Lake, and Tollymore Park, S. & P. Tullymurry, R.Ll.P.

Antrim—Near Slemish, C.H.W. & H.W.L. Clogh, H.W.L. Cullybackey, Miss Knowles. Ballinderry, Glenariff, Rasharkin, R.Ll.P.

Derry—Glen at Benevenagh, Mrs. Leebody. Kilrea and Garvagh, R.Ll.P.

Lonicera periclymenum L. To 2,000 feet in the Mournes, S. & P.

RUBIACEÆ.

Sherardia arvensis L.

Down—Frequent in the Mourne district, S. & P. Saintfield, and near Crossgar, C.H.W.

Antrim—Rasharkin, R.Ll.P.

Derry—Maghera, Kilrea, and Garvagh, R.Ll.P.

Galium boreale L.

Antrim—Among the rocks of Agnew's Hill 1804, Templeton MSS. Glenariff, Shoolbred *I.N.* Garron Point, between Ballymena and Broughshane, and by the river above Bushmills, R.Ll.P.

G. cruciatum (L.) With.

Down—Still plentiful on the side of Downpatrick rath, but no longer to be found at the Cathedral.

G. mollugo L.

Down—Lawn at Rowallen near Saintfield, D. Redmond; S.A.S., *I.N.* 1894.

Antrim—Riverside near Cullybackey, S. A. Brenan. Still at Glenarm Park, R.Ll.P.

Derry—Near Eglinton, Mrs. Leebody; H. C. Hart, *Journ. Bot.*, 1892.

VALERIANACEÆ.

Valeriana officinalis L. var. α **Mikanii** (Wats.)

Down—At 1500 feet on Slieve Muck, S. & P.

Antrim—Common in the Glens; the only form observed, Shoobred *I.N.* Sparingly by Lagan River at Mazetown, S.A.S.

var. β **V. sambucifolia** Mikan.

Down -Mourne Park and Tullybranagan, S. & P. Maxwell's Court near Comber, S.A.S.

Antrim—Plentiful by the Lagan at Maxetown, S.A.S.

Valerianella olitoria (L.) Moench.

Down—Frequent in the Mourne district, S. & P. Saintfield, C.H.W.

Antrim—Ballymena and Ballyclare, Miss Knowles. Larne, Scawt Hill, and abundant on chalk rocks on Garron Point, forming a close turf with *Saxifraga hypnoides* and *Hieracium anglicum*, R.Ll.P.

V. carinata Lois.

Down—Is increasing steadily at Dundonald, R.Ll.P.

V. dentata Willd.

Down—Maggie's Leap, Lisnacree, and abundant about Killowen and Seafield, S. & P. Killinchy (R.Ll.P.), *B.N.F.C.* 1890-1, and margins of Lough Leagh (R.Ll.P.), *B.N.F.C.* 1891-2.

DIPSACACEÆ.

Scabiosa succisa L. To 1900 feet in the Mournes, S. & P.

S. arvensis L.

Down—Frequent in the Mourne district, S. & P. Ballynahinch, R.Ll.P.

Antrim—About Ballymena, Miss Knowles.

Derry—Dungiven and Kilrea, Mrs. Leebody.

COMPOSITÆ.

Eupatorium cannabinum L.

Antrim--Lambeg, Templeton MSS. Ram's Island, Altmore, and Torr Head, R.Ll.P.

Derry—Cliffs at Downhill, R.Ll.P.

Petasites vulgaris L.

Down—Very rare in the Mourne district, S. & P. It is not generally common in the county, though abundant in Antrim.

P. fragrans L. Quite naturalized, and spreading throughout the district.

Tussilago farfara L. To 1900 feet in the Mournes, S. & P.

Erigeron acris L. The late Mr. A. G. More has informed us that this plant has been found on sandhills north of Newcastle; this is almost the same station as given in *Flora*, but is an interesting confirmation.

Solidago virgaurea L. To 2449 feet in the Mournes, S. & P.

var. **β. augustifolia** Koch.

Down—By the Bann above Hilltown, and abundant by the river in Tollymore Park, S. & P.

var. γ *S. cambrica* Huds. Not now in Tollymore Park, S. & P.; must be deleted from our flora.

Inula helenium L.

Down—Near Ballynahinch and Saul, R.Ll.P.

Antrim—Antrim, Carnlough, Portballantrae, Dunseverick, R.Ll.P.

Derry—Waste ground north of Kilrea, R.Ll.P.

Filago germanica (Huds.) L. To 500 feet in the Mournes, S. & P.

Down—Frequent in the Mourne district, S. & P. Loughinisland, R.Ll.P.

Antrim—Portrush, Bushfoot, Killagan, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

F. minima (Fries) Huds. To 500 feet in the Mournes, S. & P.

Gnaphalium sylvaticum L. To 800 feet in the Mournes, S. & P.

Down—Frequent in Mourne district, S. & P. Ballygowan, R.Ll.P.

Antrim—Glenariff, Shoolbred *I.N.* Near Ballymena, Miss Knowles. Scawt Hill, Culraney, Portrush, R.Ll.P.

Derry—Bellarena (R.Ll.P.), *B.N.F.C.* 1892-3. Kilrea and Upperlands, R.Ll.P.

Antennaria dioica (L.) R. Br.

Down—Kilbroney River, Slieve Muck, Slieve Meel-beg, S. & P.

Antrim—Clinty Hill near Ballymena, Miss Knowles. Killagan, C.H.W. Newtown Crommelin, S. A. Brenan. Pollan Burn, heaths west of Glenarm, Cushendall, Bushfoot, Rathlin Island, R.Ll.P.

Derry—Near Maghera and Garvagh, R.Ll.P.

[**Anthemis arvensis** L.

Down—Field at Glasdrumman, S. & P. Sandy field at Ballykinler, R.Ll.P.].

Matricaria inodora L. var. **β salina** Bab.

Antrim—Giant's Causeway, Shoolbred *I.N.*

var. γ maritima (L.).

Antrim—Redbay, Shoolbred *I.N.* 1894.

M. chamomilla L.

Down—Margin of Lough Island Reavy, probably casual, S. & P. Near Queen's Island, and on railway at Newry, R.Ll.P.

Antrim—Magheragall near Lisburn, and Ballygalley Head, R.Ll.P.

Increasing along the Antrim coast, and at least naturalized there; perhaps only casual elsewhere.

Chrysanthemum segetum L. To 800 feet in the Mournes, S. & P. The name *Gilgowan*, applied by inadvertence to *C. leucanthemum* in *Flora*, pertains to this species.

Tanacetum vulgare L.

Down—Occasionally in the Mourne district, S. & P. Raholp old church, and Castle Island below Downpatrick, R.Ll.P.

Antrim—Glendun, S. A. Brenan. Dunadry, Glenariff, R.Ll.P.

Senecio sylvaticus L. To 800 feet in the Mournes, S. & P.

Down—Not rare in Mourne district, S. & P. Saintfield, C.H.W. Between Dromara and Banbridge, and near Goraghwood, H.W.L. Cotton Moss, Killinchy, Loughinisland, R.Ll.P.

Derry—Ballyscullion near Lough Beg, Mrs. Leebody. Castlerock, R.Ll.P.

[**S. saracenicus** L.

Down—Saintfield, C.H.W.

Derry—Near Culmore, Mrs. Leebody. Roadsides at Magilligan, R.Ll.P. Possibly naturalized].

Bidens tripartita L.

Down—By the Bann near Hilltown, S. & P. Brown bog near Loughbrickland, H.W.L. Saul and Crossgar, R.Ll.P.

Derry—Kilrea, R.Ll.P.

B. cernua L.

Down—Killowen, Lisnacree, and near Kilkeel and Newcastle, S. & P. Loughinisland, C.H.W. Brown Bog near Loughbrickland, H.W.L.

var. radiata Sond.

Down—Plentiful at Carrickmannan Lake, S.A.S., and in the Quoile marshes, R.Ll.P.; S.A.S., *I.N.* 1894.

Saussurea alpina DC.

Down—Sparingly in fissures of dripping vertical slate rocks at 2000 feet on Slieve Muck North, S. & P. An interesting addition to the alpine plants of the district.

Arctium nemorosum Lej.

Down—Moygannon and Newcastle, S. & P. Ballykinler, Ballyhornan, and Ballyholme, S.A.S.

Antrim—Fair Head, Shoolbred *I.N.* Islandmagee and near Antrim, S.A.S.

A. intermedium Lange.

Down—Sandy waste at Benderg Bay, and by old road from Ballynahinch to Drumaness, S.A.S.

Antrim—Quarry at Ballygalley Head, S.A.S.

Derry—Magilligan, Mrs. Leebody.

A. minus Schkur.

Down—Benderg Bay and at Moygannon, S.A.S.

var. **majusculs** Hartm.

Antrim—Riverside at Crumlin, and at Bankheads near Larne, S.A.S. (*fide* Svante Murbeck).

The specimens so named by the eminent Swedish botanist seem to be almost identical with the *A. intermedium* Lange of Babington's Manual ed. 8.

Carduus crispus L. var. β. **C. acanthoides** L.

Down—Fields and waste ground at Killowen, S. & P.

Antrim—Refound at Larne by R.Ll.P. ; S.A.S., *I.N.* 1894.

Derry—Still common at Magilligan; recently seen by R.Ll.P. at Bellarena (*B.N.F.C.* 1892-3) and about Magilligan station.

C. palustris L. To 1000 feet in the Mournes, S. & P.

C. pratensis Huds.

Down—Throughout the Kilbroney valley to 700 feet, sparingly by the Causeway Water, and by the Shimna near Newcastle, S. & P.

Antrim—Northern extremity of Lough Beg, Killagan, Dunloy, and Portballantrae, R.Ll.P.

Derry—Castlerock, Bran Lough above Maghera, near Garvagh, and by the Bann at Coleraine, R.Ll.P.

[**Silybum marianum** Gaert.

Down—Crawfordsburn, R.Ll P.

Antrim—White Park Bay, R.Ll.P.]

[**Onopordum acanthium** L.

Antrim—Waste ground near a cottage at Ballygalley Head, S.A.S. and R.Ll.P., 1887. A casual since lost.]

Cichorium intybus L.

Down—Cornfield near Kilkeel, casual, S. & P. Uncultivated ground at Lisnatrunk, J. H. Davies. Saintfield, and quarry bank at Magheralin, C.H.W.

Antrim—Broughshane, Herb. Canon Grainger. Glynn, and Portrush sandhills, casual, R.Ll.P.

R.Ll.P. considers that this plant is only a casual in the district.

Leontodon hirtus L.

Down—Fields by the sea at Dalchoolin near Craigavad, R.Ll.P., *B.N.F.C.* 1892-3. Lawn at Narrow-water Castle (R.Ll.P.), B.N.F.C. Excursion, *I.N.* 1893.

L. hispidum L. The specimen which apparently represents this species in Dr. Moore's set of Derry plants in Dublin Museum is a hispid form of *L. autumnale*, and as the species has not been found by any other botanist on the well-searched fields of Magilligan, its right to a place in our flora is very doubtful.

L. autumnalis L. To 2810 feet in the Mournes, Hart *R.I.A.*

L. taraxacum L. To 1000 feet in the Mournes, S. & P.

var. β. **L. palustre** Smith.

Antrim—Cushendun, R.Ll.P.

Tragopogon porrifolius L. Is still abundant at Macedon, Sydenham, and Knock, and has spread to railway bank at the Kinnegar at Holywood, where it has been abundant for the last two years (R.Ll.P.); may fairly be considered naturalized in the district.

Crepis biennis L.

Down—Meadows between Crossgar and Downpatrick, R.Ll.P. Is still steadily increasing in the district, and may rank as naturalised.

C. virens L. To 1200 feet in the Mournes, S. & P.

C. paludosa (L.) Moench.

Down—Ballymacormick Point, a few feet above sea-level, R.Ll.P.

Antrim—Stoneyford, Shane's Castle, and abundant in the glens along the coast, R.Ll.P.

Derry—By the Roe, Mrs. Leebody. Kilrea and Garvagh, R.Ll.P.

Hieracium anglicum Fr. 200-2000 feet in the Mournes, S. & P.

Down—The most abundant hawkweed in the Mournes, S. & P.

Antrim—Fair Head and Giant's Causeway, Shoolbred *I.N.* Rocks north of Ballycastle, S.A.S.

var. b. **acutifolium** Backh.

Down—Luke's Mountain at 1000 feet, and by the Shimna River above Tollymore Park, S. & P.

var. d. **longibracteatum** Hanb.

Antrim—Garron Point and Glenariff, W. A. Shoolbred; S.A.S., *I.N.* 1894.

H. iricum Fr.

Derry—Basaltic cliffs, Downhill, R.Ll.P.

H. flocculosum Backh.

Down—By Spinkwee River at 800 feet (not 1500 feet, as given in *Flora*), and by the same stream on shady rocks in Tollymore Park, S. & P.

Antrim—Sallagh Braes, S.A.S.

H. Leyi Hanb.

Antrim—Benevenagh, W. A. Shoolbred; S.A.S., *I.N.* 1894 (as *H. bifidum* Tausch).

H. Schmidtii Tausch.

Down—Granite cliffs of Bencrom, S. & P.

The Antrim and Derry localities, published in *Flora* for *H. pallidum*, have been mostly transferred to *H. euprepes*; the remainder are doubtful.

H. lasiophyllum Koch. The Ballycastle record has been transferred to *H. anglicum*.

H. Farrense Hanb.

Antrim—Sallagh Braes, S.A.S.; R.Ll.P., *B.N.F.C.* 1892-3.

H. rubicundum Hanb.

Antrim—Sallagh Braes, S.A.S.; R.Ll.P., *B.N.F.C.* 1892-3.

H. argenteum Fr. 100-1700 feet in the Mournes, S. & P.

Down—Cove Mountain, Bencrom, Slieve Donard, and Tollymore Park, S. & P.

The *H. argenteum* of *Flora* is transferred to *H. hibernicum*.

H. Sommerfeltii Lindeb.

Derry—Benevenagh, S.A.S.

H. hibernicum Hanb.

Down—Mountain stream in the Mourne Mountains near Rostrevor, H. C. Hart. *Journ. Bot.* 1886 (as *H. argenteum* Fr.). Refound on rocks at Broughnamaddy (the same station), S. & P.

H. stenolepis Lindeb.

Antrim—Cave Hill, R.Ll.P., and plentiful on Knockagh and Sallagh Braes, S.A.S.; R.Ll.P., *B.N.F.C.* 1890-1. Garron Point, W. A. Shoolbred; S.A.S., *I.N.* 1894. Glenariff, Shoolbred *I.N.*

Derry—Benevenagh, Shoolbred *I.N.*

H. murorum L. pt.

Down—Very rare in the Mournes; found only by the Bann, S. & P.

Antrim—Garron Point, Shoolbred *I.N.*

var. m. **pachyphyllum** Purchas.

Antrim—Basaltic cliffs of Knockagh and Sallagh Braes, S.A.S.; W. H. Purchas, *Journ. Bot.* 1895.

H. euprepes Hanb.

Antrim—Cave Hill, Dr. Mateer, 1845, Herb. Hanbury. Sallagh Braes, S.A.S.; R.Ll.P., *B.N.F.C.* 1892-3. Bank at Milltown near Red Bay, W. A. Shoolbred; S.A.S., *I.N.* 1894.

Derry—Benevenagh, S.A.S.

H. cæsium Fr.

Antrim—Glenariff (S.A.S.), *B.N.F.C.* 1889-90.

H. vulgatum Fr.

Down—Blue Lough, Hare's Gap, Slieve Muck North, S. & P.

H. sciaphilum Uecht.

Down—Saintfield, D. Redmond.

H. gothicum (Fr. pt.) Backh. (*H. Friesii* Hartm.).

Antrim—Riverbanks in Glendun, Shoolbred *I.N.*

var. **Stewartii** Hanb. 350-950 feet, S. & P.

Down—Several spots by the Bann above Hilltown, and sparingly in Tollymore Park, S. & P. (as *H. Friesii*, Hartm.). It grows along the course of the Bann for about three miles.

H. corymbosum Fr.

Antrim—Riverbanks in Glendun, Shoolbred *I.N.*

H. auratum Fries. 150-1500 feet in the Mournes, S. & P.

Down—The most abundant accipitrine Hawkweed in the Mournes, S. & P.

Antrim—Lough Neagh shore at Cranfield, S.A.S., and sea-cliffs at Cushendun, R.Ll.P.; R.Ll.P., *B.N.F.C.* 1892-3. Several places in Glendun, Shoolbred *I.N.*

H. crocatum Fr.

Down—By the Shimna River, and on Pigeon Rock Mountain, S. & P.

Antrim—Milltown near Redbay, and Glendun, Shoolbred *I.N.*

H. boreale Fr.

Down—Abundant by the Shimna River above Tollymore Park, S. & P. (as *H. commutatum*, Beck.).

CAMPANULACEÆ.

Lobelia Dortmanna L. 330-1350 feet in the Mournes, S. & P. There is no lake at 1500 feet, the elevation given by Hart, *R.I.A.*

Down—Lough Shannagh and Altnadua Lake, S. & P.

Antrim—Abundant in a lakelet on summit of Binnagee near Carnlough, at 1000 feet, R.Ll.P., *B.N.F.C.* 1890-1.

Jasione montana L. To 1500 feet in the Mournes, S. & P.

Campanula rapunculoides L.

Down—Fields near Rostrevor and north of Newcastle, S. & P.

Antrim—In a sandpit near Broughshane, R.Ll.P.

Derry—Common in a field near Kilrea, R.Ll.P.

Has persisted in the sandy land near Newcastle for over 20 years, and is naturalized at least here.

C. rotundifolia L. To 2450 feet on the Mournes, Hart *R.I.A.*

ERICACEÆ.

Arctostaphylos uva-ursi (L.) Spreng. Dr. Dickie's Slieve Donard plant was no doubt *Vaccinium vitis-idæa*, S. & P.

Erica tetralix L. To 2055 feet on the Mournes, S. & P.

E. cinerea L. To 2440 feet on the Mournes, S. & P.

Vaccinium vitis-idæa L. 1500-2796 feet on the Mournes, S. & P. 200-2000 feet in Derry.

Down—On most of the Mourne summits, S. & P.

Antrim—Among the rocks of Agnew's Hill, 1804, Templeton MSS. Head of Glenariff, S. A. Brenan. Near Cranny Lough west of Carnlough, R.Ll.P.

Derry—Bank by the roadside between Kilrea and Garvagh, at 200 feet elevation, R.Ll.P., *Journ. Bot.* 1894. Summit of Mullaghclogher, R.Ll.P.

V. oxycoccos L.

Down—Marsh at Saul Camp near Downpatrick, R.Ll.P., *B.N.F.C.* 1892-3.

Antrim—Lakelet N.W. of Carnlough, at 1000 feet, R.Ll.P., *B.N.F.C.* 1892-3. Evish above Glenariff, S. A. Brenan. Abundant on the extensive bogs above Dunloy and Rasharkin, R.Ll.P.

Derry—Bog on margin of Lough Ouske in the Sperrin Mountains, R.Ll.P., *B.N.F.C.* 1892-3.

Pyrola media Swartz.

Down—Still abundant on Conlig Hill.

Antrim—Near Cairn Hill and Irish Hill, W. Macmillan. Rocky thicket between Kilrea and Garvagh, Miss Knowles.

P. minor L.

Down—Between the Barbican gate and the sawmill in Tollymore Park, H.W.L.

Antrim—Refound in Glenariff, S. A. Brenan.

P. secunda L. Though carefully searched for at Errigal Banks by Mrs. Leebody, Miss Knowles, and R.Ll.P., this rare plant has not been refound, though *P. media* and *P. minor*, recorded from the same place by Dr. Moore, are still abundant there. Neither has it been refound in any of the other stations given by Dr. Moore; yet the specimens (or rather some of them) preserved in Dr. Moore's herbarium are undoubtedly *P. secunda*.

AQUIFOLIACEÆ.

Ilex aquifolium L. To 1050 feet in the Mournes, Hart *R.I.A.*

OLEACEÆ.

Fraxinus excelsior L. To 1000 feet in the Mournes, S. & P.

GENTIANACEÆ.

Erythræa centaurium (Curt.) Pers. var. b. **capitata** (Koch).

Antrim—Sand-banks near Giant's Causeway, Shoolbred *I.N.*

Gentiana amarella L. The specimen which apparently represents this species in Dr. Moore's Derry herbarium is *G. campestris*. *G. amarella* has not been found in the district by any recent botanist.

G. campestris L.

Down—Spelga Mountain near Rostrevor, and by the Causeway water, S. & P. Ballykinler, and still on the Kinnegar at Holywood, R.Ll.P.

Antrim—Frequent throughout the county. Many localities might be added to the list already published.

Derry—Eskers south of Kilrea, R.Ll.P.

Menyanthes trifoliata L. To 1600 feet in the Mournes, S. & P.

CONVOLVULACEÆ.

Convolvulus arvensis L.

Down—Rostrevor, Killowen, Kilkeel, Newcastle, S. & P. Killough Bay (R.Ll.P.) *B.N.F.C.* 1892-3. Abundant on the coast near Millisle, J. H. Davies. Queen's Island, Newtownards, Ballydugan Lake, R.Ll.P.

Antrim—Along the railway from Belfast to Larne, where it has come with ballast, which is obtained on the Curran, where the plant grows abundantly, R.Ll.P.

Derry—Ballykelly, Mrs. Leebody. Bann mouth and Limavady Junction, R.Ll.P.

BORAGINACEÆ.

Cynoglossum officinale L.

Down—Abundant on shore at Killowen, rising to 500 feet on the adjoining stony slopes of Spelga Mountain, S. & P.

[**Borago officinalis** L.

Antrim—Sandhills at White Park Bay, away from any houses, W. J. Knowles.]

Anchusa sempervirens L.

Down—Between Dundonald and Comber, R.Ll.P.

Antrim—Ballyrobert, Parish of Shankill, Herb. D.M. Cullybackey, probably escaped, Miss Knowles. Oldstone near Antrim, W. S. Smith.

Symphytum officinale L.

Down—Near Hilltown and Newcastle, S. & P. Queen's Island, Knocknagoney, Ballynahinch, R.Ll.P.

Antrim—Portrush, Dunseverick, and about Portballantrae, R.Ll.P.

Derry—Magilligan, Mrs. Leebody. Kilrea, R.Ll.P.

S. tuberosum L. Rev. G. Robinson's station is among the woods close to Clandeboye House, where the plant grows abundantly, and appears quite naturalized, though it probably originated in the garden there, R.Ll.P.

Echium vulgare L.

Down—Abundant in a field near Wood House, Rostrevor, S. & P. Kirkiston, C.H.W. On the railway at Ballymacarrett Junction, casual, R.Ll.P.

Antrim—Magheramorne, probably casual, R.Ll.P.

Mertensia maritima (L.) Don.

Down—Extending for nearly a mile along the shingly beach at Glasdrumman south of Newcastle, S. & P. This is Templeton's station.

Derry—Between Portrush and Portstewart, Mrs. Leebody.

This last is the locality mentioned by Sampson (*Statistical Survey of the County of Londonderry*, 1802) when he speaks of the "oyster plant" as growing "on the shore at Ballyaghran . . . . on the gravel, close to the sea" and is an interesting confirmation of an old record not mentioned in *Flora*.

Lithospermum arvense L.

Antrim—Brickfield near Saltwater Bridge, Belfast, Dr. J. L. Drummond, 1820; Belfast Museum Herb. This station is long since built over, and become part of the city.

Myosotis palustris With.

Down—Near Rostrevor and Newcastle, rare in the Mournes, S. & P. Ballynahinch and Loughinisland, R.Ll.P.

Antrim—Bush River and Crumlin Waterfoot, R.Ll.P.

The Slieve Donard station of *Flora* belongs to *M. repens*.

var. b. **strigulosa** Reichb.

Antrim—Cushendun, Shoolbred *I.N.*

M. repens Don. To 1000 feet in the Mournes, S. & P.

Down—Abundant on the flanks of the mountains and low grounds of Mourne, S. & P. Crossgar, R.Ll.P.

Derry—Near Upperlands, R.Ll.P.

M. collina Hoffm.

Down—Kirkiston, C.H.W.

Antrim—Gravelly banks at mouth of Sixmile River, R.Ll.P., *B.N.F.C.* 1892-3.

Derry—Portstewart, Miss Davies, *B.N.F.C.* 1889-90.

SOLANACEÆ.

Solanum dulcamara L.

Down—Glasdrumman near Annalong, S. & P. Hedges between Killough and Ardglass, C.H.W. Grey Point and Ballynahinch, R.Ll.P.

Antrim—Ballycastle, R. Welch. Near Ballymena, Miss Knowles.

Derry—Dungiven, and by the Foyle, Mrs. Leebody.

Hyoscyamus niger L.

Down—Plentiful on distillery rubbish at Comber, imported with seed, S.A.S., *I.N.* 1894.

Antrim—A few plants at Glenmore near Lisburn in 1890, but not found since, J. H. Davies. Carnlough, casual, Rev. J. Hall. Still about Ballycastle, R.Ll.P.

OROBANCHACEÆ.

Orobanche rubra Sm.

Antrim—"Gathered near Ballycastle, Oct. 1797," R. Brown (as *O. major*). Kinbane Head, R.Ll.P.

Derry—Castlerock, R.Ll.P.

[**O. minor** Sm.

Down—Abundant in a field by the sea at Craigavad, 1892, H. C. Marshall; R.Ll.P., *B.N.F.C.* 1892-3. Also in 1893, H. C. Marshall. No doubt introduced with seed, along with the Lucerne on which it grows, but in view of the spread of this species in Ireland, its behaviour should be watched.]

Lathræa squamaria L.

Antrim—At Whitehall near Broughshane, on Plum, S. A. Brenan.

Derry—Bellarena, Mrs. Leebody.

SCROPHULARIACEÆ.

Verbascum thapsus L.

Down—Stony beach north of Killowen, S. & P. Disused gravel-pit near Lambeg, J. H. Davies. Hillsborough demesne, and on walls and waste ground at Downpatrick, R.Ll.P.

Antrim—Shore of Lough Neagh in Glenavy Parish, Herb. D. M.

Derry—Dungiven and Limavady, Mrs. Leebody.

[**Erinus alpinus** L.

Down—Growing freely on the wall of the gaol at Downpatrick, 1890, R.Ll.P., *B.N.F.C.* 1892-93; and still there. A south European plant, now established in the North of England, but apparently not previously noticed in Ireland.]

Digitalis purpurea L. To 1400 feet in the Mournes, S. & P.

Linaria repens Ait.

Down—Abundantly in fields, on banks, by roadsides, and seashore at Killowen, and thence to Seafield; first noticed here by R.Ll.P. in June, 1884, S. & P.

L. vulgaris Mill.

Down—Crossgar, Killyleagh, Loughinisland, Killinchy, Newry, R.Ll.P.

Antrim—Ram's Island, Broughshane, Dunloy, Dervock, Ballycastle, R.Ll.P. Near Doagh, Rev. W. S. Smith.

The Killowen record under this name belongs to *L. repens*.

Scrophularia aquatica L.

Between Warrenpoint Church and Gasworks, S. & P. Sparingly b Castlewellan Lake, S.A.S.

Derry—By the Bann at Coleraine, Mrs. Leebody. Dr. Moore's note "Very common in the county" is certainly an error; the above is the only station we know of.

Melampyrum pratense L. 100-1400 feet in the Mournes, S. & P.

Down—Sparingly on cliffs of Eagle Mountain, S. & P. The Mourne records of *Flora* probably belong to var. *montanum*, excepting Tollymore Park, where the type grows abundantly.

Antrim—Shane's Castle, W. D. Donnan. Runabay Head, Carnlough, rocks near Lough Naroon, and heath above Rasharkin, R.Ll.P.

Derry—Bog near Portglenone, Miss Knowles. Wood near Kilrea, R.Ll.P.

var. b. **latifolium** Syme.

Antrim—In the glens, Shoolbred *I.N.*

var. c. **M. montanum** Johnst. 1400-2394 feet in the Mournes, S. & P.

Down—Many places in the Mournes, S. & P.

Antrim—In the glens, Shoolbred *I.N.* On Knocklayd at 1500 feet, R.Ll.P.

M. sylvaticum L.

Antrim—Glenoe, 1837, Herb. D.M.

Thompson's Tollymore Park plant was no doubt a form of *M. pratense*, S. & P.

Mimulus luteus L.

Down—Edge of Clandeboye Lake, R.Ll.P.

Thoroughly naturalized in the district.

Rhinanthus crista-galli L. To 1000 feet in the Mournes, S. & P. 1690 feet in Antrim (summit of Knocklayd), R.Ll.P.

Bartsia odontites Huds. var. b. **serotina** (Reichb.)

Antrim—Giant's Causeway, Shoolbred *I.N.*

Euphrasia officinalis L. To 2300 feet in the Mournes, S. & P.

var. b. **E. gracilis**, Fries.

Down—By Bloody Bridge River, S.A.S.

Antrim—Between Ballyearth and Ballintoy, Shoolbred *I.N.* Basalt debris on Knockagh, S.A.S.

Veronica scutellata L.

Down—A number of stations in the Mournes, S. & P. Magheralin, C.H.W. Dundonald, Conlig, Downpatrick, R.Ll.P.

Antrim—Refound on Rathlin, R.Ll.P., *B.N.F.C.* 1889-90. Ballycastle, Killagan, above Lisburn, and near Scawt Hill, R.Ll.P.

Derry—Enagh Lough, Mrs. Leebody. Kilrea, R.Ll.P.

V. anagallis L.

Down—Lisnacree, Narrow-water, White Water, S. & P. Ballynahinch, C.H.W. Newtownards and Killinchy, R.Ll.P.

Antrim—Lisburn, Stoneyford, Doagh, Crumlin, Shane's Castle, R.Ll.P.

Derry—Bellarena, Mrs. Leebody. Coleraine, R.Ll.P.

V. montana L.

Down—Saintfield, C.H.W. Downpatrick, R.Ll.P.

Antrim—Glendun, S. A. Brenan. Shaw's Bridge, Langford Lodge, Bushmills, R.Ll.P.

Derry—Bellarena and Prehen, Mrs. Leebody. Kilrea, R.Ll.P.

V. serpyllifolia L. To 1000 feet in the Mournes, S. & P.

V. polita Fr.

Down—Frequent in Mourne district, S. & P. Cultra, R.Ll.P.

Antrim—Bushmills, S.A.S., *I.N.* 1894.

Derry—Coleraine, Mrs. Leebody. Kilrea and Castlerock, R.Ll.P.

V. Buxbaumii Ten.

Down—Rostrevor, Killowen, Greencastle, S. & P. Dundrum, C.H.W. Kilmore near Crossgar, H.W.L. Millisle, R.Ll.P.

Antrim—Ballymena and Glenariff, Miss Knowles. Rathlin Island, R.Ll.P., *I.N.* 1893.

V. hederifolia L.

Down—Killowen, S. & P. Saul and Newcastle, C.H.W. Craigavad, W. D. Donnan.

Antrim—Rathlin Island, R.Ll.P., *I.N.* 1893. Stoneyford and Islandmagee, R.Ll.P.

LABIATÆ.

[**Mentha viridis** L.

Down—Stream by roadside at Saul, C.H.W.]

[**M. rotundifolia** L.

Down—River-side near Ballynahinch, Richd. Hanna. Near Saul Chapel, and between Newtownards and Comber, R.Ll.P.]

[**M. alopecuroides** Hull.

Down—Stream by roadside at Saul, C.H.W., *Watson B.E.C.* 1893.]

M. piperita Huds.

Down—Plentiful by the old road between Ballynahinch and Drumaness, Richd. Hanna.

M. sativa L. var. β. **M. rubra** Huds.

Down—Saintfield, C.H.W.

var. paludosa (Sole).

Derry—Limavady Junction, Mrs. Leebody; S.A.S., *I.N.* 1894.

M. pulegium L.

Antrim—Abundant in a damp meadow near the north end of Lough Beg, Miss Knowles and R.Ll.P.

Not now to be found at foot of Tullybranagan Mountain, Down (*Ir. Flor.*), S. & P.

Lycopus europæus L.

Down—Annalong, and Narrow-water demesne, S. & P. Near Crossgar, C.H.W. Portavoe and Killinchy, R.Ll.P. By Ballyward Lake, S.A.S.

Derry—Upperlands, Kilrea, and near Portglenone, R.Ll.P.

Origanum vulgare L.

Down—Walls of Templepatrick graveyard, Richd. Hanna.

Derry—Eglinton, Mrs. Leebody.

Thymus serpyllum L. To 2050 feet in the Mournes, Hart *R.I.A.* To 2000 feet, S. & P.

Scutellaria galericulata L.

Down—By canal south of Scarva, H.W.L. and C.H.W. Loughinisland, R.Ll.P.

Antrim—Glenmore near Lisburn, J. H. Davies. Cushendun, S. A. Brenan. Roadside near Rasharkin, Miss Knowles. Langford Lodge, R.Ll.P.

Nepeta cataria L.

Down—Abundant by a roadside at Cloughey Bay, C.H.W.

Lamium amplexicaule L.

Down—Kilbroney, Killowen, Knockshee, Greencastle, Annalong, S. & P. Killough Bay (R.Ll.P.), *B.N.F.C.* 1892-3. Rough Island, Ballywater, Ballykinler, R.Ll.P.

Antrim—Stoneyford, Broughshane, R.Ll.P.

Derry—Dungiven, Mrs. Leebody.

L. intermedium Fries. Throughout Down and Antrim. Numerous further stations might be quoted.

T. hybridum Villars.

Down—Killowen, and Glasdrumman near Annalong, S. & P.

Antrim—Carnlough, R.Ll.P.

T. album L.

Down—Kilmore near Crossgar, C.H.W. Loughbrickland, H.W.L. Narrow-water, R.Ll.P.

Antrim—Broughshane, S. A. Brenan. Magheramorne, R.Ll.P.

Galeopsis speciosa Mill.

Down—Annalong, Hart *R.I.A.* Field at Six-road-ends near Conlig, S.A.S., *I.N.* 1894.

Antrim—Frequent in sandy cornfields in the neighbourhood of Cushendall, July, 1836, Herb. D. M. Still at Cushendall, R.Ll.P., *B.N.F.C.* 1890-91. Glenariff, Ardclinis, and Cushendun, R.Ll.P., *B.N.F.C.* 1892-3. Breckagh in parish of Skerry, S. A. Brenan.

Derry—Eglinton, and near Enagh Lough, Mrs. Leebody. Half way between Kilrea and Maghera, R.Ll.P.

Stachys betonica (L.) Benth.

Derry—Refound at Kilrea by Mrs. Leebody; S.A.S., *I.N.* 1894. It grows here in some abundance in several pasture fields between the weir and the bridge, R.Ll.P.

S. sylvatica x palustris.

Down—Struell wells near Downpatrick, R.Ll.P.

Antrim—Islandmagee, Herb. D. M. Roadside bank near Belfast, S.A.S., *B.E.C. Report* 1889. Carnlough, and Magheragall near Lisburn, R.Ll.P.

Hybrids nearer *palustris* than *sylvatica* are the prevailing forms in the district. The only station we know for true *S. ambigua* Smith is that of S.A.S. given above, which is near Glenville, on the road from Hannahstown to Woodburne.

S. arvensis L.

Down—In some abundance from Newcastle to Kilkeel, and very abundant at Killowen, S. & P. Fields by shore south of Killough, and between Castlewellan and the Factory, S.A.S. Saul, R.Ll.P.

Antrim—Broughshane, and west base of Knocklayd, R.Ll.P.

Ballota alba L.

Down—Near Warrenpoint, S. & P. Ballynahinch, and Ballykinler, R.Ll.P.

Antrim—Near Moira, 1837, Herb. D. M. Brown's Bay on Islandmagee, (R.Ll.P.) *B.N.F.C.* 1892-3. Cushendun, S. A. Brenan. Ballycastle and Bushmills, R.Ll.P.

Teucrium scorodonia L. To 1400 feet in the Mournes, S. & P.

VERBENACEÆ.

[**Verbena officinalis** L.

Down—Roadside about a mile from Pointzpass on the way to Loughbrickland, H.W.L.; R.Ll.P., *B.N.F.C.* 1892-93.; and still there, H.W.L.]

LENTIBULARIACEÆ.

Pinguicula vulgaris L. To 2000 feet in the Mournes, S. & P.

P. lusitanica L. 0-1600 in the Mournes, S. & P.

Down—A number of stations in the Mournes, S. & P.

Antrim—On moist banks near the Giant's Causeway, Herb. D. M. Glendun, S. A. Brenan. Margins of Lough Naroon, Miss Knowles and R.Ll.P. Cushendall, R.Ll.P.

Derry—"Gathered on a bog by the roadside about half way between Londonderry and Newtownlimavady, Aug. 6th, 1795," R. Brown. Bran Lough above Maghera, R.Ll.P.

Utricularia vulgaris L.

Down—Altnadua Lake, and site of Moneyscalp Lake, S. & P. Brown Bog near Loughbrickland, H.W.L. Lake near Helen's Tower, R.Ll.P.

Antrim—Very fine in clayey holes below the Asylum, Belfast, 1837, Herb. D.M. Portmore, R.Ll.P.

Derry—Lakelets near Kilrea, R.Ll.P.

U. intermedia Hayne.

Antrim—On a large peat-bog near Rasharkin, D.M.; *Cybele Hibernica*. Abundant and fine in a boggy pool about a mile west of Lough Naroon, R.Ll.P.

U. minor L.

Down—Anahilt bog, and bog near the head of Kilkeel River [still there, S. & P.], Templeton MSS. Altnadua Lake, S. & P. Near Crossgar, C.H.W. Pollramer Lake, S.A.S. Ballydugan Lake, R.Ll.P.

Antrim—In marshes along the shore of Lough Beg, and near Trostan mountain, 1837, Herb. D.M. Bog north of Ballymoney, R.Ll.P.

Derry—Bogs near Maghera, and Garvagh, R.Ll.P.

PRIMULACEÆ.

Hottonia palustris L. "Everogue's Bridge," the original station for this plant, is Crossgar, where it still grows abundantly, R.Ll.P., *B.N.F.C.* 1890-1.

Primula vulgaris L. To 1500 feet in the Mournes, S. & P.

[**P. veris** L.

Antrim—Rare, only found in Glenarm Park, 1837, Herb. D. M. Lambeg, in old pastures, H.W.L.]

Not refound by S. & P. at Rostrevor, the only station in which the authors of *Flora* considered it might be native. "Must be removed from the list of native plants," S.A.S., *I.N.* 1894, in which opinion R.Ll.P. agrees. To show how this plant may be introduced to wild-looking habitats, we may quote the following note by R.Ll.P.:—"Abundant in an old pasture at Cherryvalley near Crumlin. On enquiry it transpired that the stream that waters this meadow passes through a stack-yard in which was stored hay that grew on the lawn at Cherryvalley, where cowslips had been formerly planted, and hence the plant spread to the present station. The cowslips appeared in the meadow the year after the lawn had been cropped for hay."

Lysimachia vulgaris L.

Down—Lakeside at Portavoe, and still at Lough Leagh, R.Ll.P.

L. nummularia L.

Down—Kilmore near Crossgar, C.H.W.

Antrim—Lough Neagh shore at Langford Lodge, R.Ll.P.

Anagallis arvensis L. var. β. **A. cœrulea** Schreb.

Antrim—Bank near the gate of Belfast Botanic Garden, J. J. Andrew; R.Ll.P., *B.N.F.C.* 1890-1.

A. tenella L. To 1600 feet in the Mournes, S. & P.

Down—Frequent in Mourne district, S. & P.

Antrim—Throughout the county, R.Ll.P.

Centunculus minimus L.

Down—Abundant on drained site at Ballymartin Lake, near Annalong, S. & P.

Samolus valerandi L.

Down—Narrow-water demesne and mouth of White Water, S. & P.

Antrim—Shores of Lough Beg, Miss Knowles. Portrush and Dunluce, R.Ll.P.

PLUMBAGINACEÆ.

Statice bahusiensis Fr.

Down—Many places on both sides of Strangford Lough, R.Ll.P.

Antrim—Abundant at upper end of Larne Lough, R.Ll.P.

PLANTAGINACEÆ.

Plantago lanceolata L. To 1150 feet in the Mournes, S. & P.

P. major L. var. **P. intermedia** Lilib.

Antrim—Plentiful on shore of Lough Neagh at Crumlin waterfoot, S.A.S.

Littorella lacustris L. To 1350 feet in the Mournes, S. & P.; there is no lake at 1500 feet, the elevation given by H. C. Hart, *R.I.A.*

CHENOPODIACEÆ.

Salsola kali L.

Antrim—Bushfoot, White Park Bay, R.Ll.P.

Derry—Benone, Mrs. Leebody.

Chenopodium bonus-henricus L.

Antrim—Ballee, Miss Knowles. Cullybackey, S. A. Brenan. Clough and Broughshane, H.W.L. Magheragall near Lisburn, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

Beta maritima L.

Down—Dunnyneile Island near Killyleagh (R.Ll.P.), *B.N.F.C.* 1891-2. Portavoe and Millisle, R.Ll.P.; S.A.S., *I.N.* 1894. Newry, R.Ll.P.

Antrim—Maritime rocks from White Park to Derrygregor Head, 1836, Herb. D.M. Refound on Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-90. White Park Bay and Kinbane Head, R.Ll.P.; S.A.S., *I.N.* 1894.

Derry—Downhill, Mrs. Leebody.

Atriplex erecta Huds.

Down—Newcastle, S. & P.

Derry—Bellarena, Mrs. Leebody.

A. deltoidea var. β. **A. salina** Bab.

Derry—Shore near Bellarena, Mrs. Leebody.

A. farinosa Dum.

Down—Shore south of Millisle, and still at Groomsport and Newcastle, R.Ll.P.

Antrim—Redbay, Cushendun, and Bushfoot, R.Ll.P., *B.N.F.C.* 1892-3. Foraff, Miss Knowles.

A. portulacoides L.

Down—Plentiful on sea-shore close to railway bank half a mile north of Dundrum, Richd. Hanna.

This is its most northerly station in Ireland. In its other habitat in our district, near Warrenpoint, it is abundant, and extends from Newry southwards.

POLYGONACEÆ.

Rumex sanguineus L. The type is extremely rare. R.Ll.P. has observed it for some years by the roadside between Ballycastle and the sea, which is the only station we know of.

R. hydrolapathum Huds.

Down—Loughinisland (R.Ll.P.), *B.N.F.C.* 1889-90. Ditches on site of Moneyscalp Lake, S. & P. Near Killyleagh (R.Ll.P.), *B.N.F.C.* 1891-2. Kilmore near Crossgar, C.H.W. Tullymurry, Saul, and Ballydugan, R.Ll.P.

Antrim—Near Antrim, D. Redmond.

In the Downpatrick marshes it grows in immense abundance, so that in autumn many acres are tinged red and brown with its stems and fruit.

R. acetosa L. 2790 feet in the Mournes, Hart *R.I.A.* 1891.

R. acetosella L. 2790 feet in the Mournes, Hart *R.I.A.* 1891.

Polygonum bistorta L.

Antrim—Shore of Lough Neagh at Langford Lodge, H.W.L.

P. lapathifolium L.

Down—Abundant on shore of Warrenpoint town reservoir, S. & P.

P. maculatum Dyer.

Down—Dundrum, 1894, C.H.W.

P. aviculare L. var. β. **P. littorale** Link.

Down—Sandy shores at Newcastle and Mill Bay, S. & P.

P. Raii Bab.

Down—Newcastle, S.A.S.; Millisle, R.Ll.P.

Antrim—Redbay and Ballycastle, R.Ll.P.; S.A.S., *I.N.* 1894.

EMPETRACEÆ.

Empetrum nigrum L. 1900-2796 feet in the Mournes, S. & P. 0-1690 feet in Antrim, R.Ll.P.

Antrim—Bogs above Dunloy and Rasharkin, summit of Knocklayd, and at sea-level at Torr, R.Ll.P.

EUPHORBIACEÆ.

Euphorbia exigua L.

Down—Killowen, S. & P. Margins of Lough Leagh (R.Ll.P), *B.N.F.C.* 1891-2. Ballyknowe, near Downpatrick (R.Ll.P.), *B.N.F.C.* 1892-3. Conlig, W. D. Donnan. Crossgar and Tullymurry, R.Ll.P.

Antrim—Common about Ballymena, Miss Knowles.

Derry—Kilrea and Ballyscullion, Mrs. Leebody.

Mercurialis perennis L.

Down—In quantity on the "Dane's Cast," close to Scarva House, H.W.L.

Antrim—Still very abundant at Langford Lodge, R.Ll.P.

CERATOPHYLLACEÆ.

Ceratophyllum demersum L.

Down—Carrickmannan Lake near Saintfield, C.H.W.

CALLITRICHACEÆ.

Callitriche stagnalis Scop. 1320 feet in the Mournes, Hart *R.I.A.*

C. hamulata Kuetz. To 1150 feet in the Mournes, S. & P.

var. **β. C. pedunculata** DC.

Down—Mill-dam near Hilltown, S. & P.

C. autumnalis L.

Down—Castlewellan Lake, Annsboro' Lake, and Long Lough, S.A.S. Derry Lake, R.Ll.P.

Antrim—In Lough Neagh at Portmore, Templeton MSS. Abundant in ditches by the Lagan Canal and shores of Lough Neagh, 1837, Herb. D.M. In the river at Bushfoot, and in the Bann at Toome, R.Ll.P.; S.A.S., *I.N.* 1894.

Derry—Growing in the River Bann a little above the bridge, Templeton MSS. Abundant in canal at Kilrea, R.Ll.P.

URTICACEÆ.

Parietaria officinalis L.

Down—Tullybranagan near Newcastle, and Killowen, S. & P. Newry and Clough Castle, H.W.L.

Antrim—Kilroot old church, R.Ll.P.

CANNABINACEÆ.

[**Humulus lupulus** L.

Antrim—Cloghmills, H.W.L.]

AMENTIFERÆ.

Salix pentandra L.

Down—By the Yellow Water in the Mournes, S. & P. Crawfordsburn, Moira, Tullymurry, R.Ll.P.

Antrim—Near Templepatrick, S.A.S. Glendun, S. A. Brenan. Lisburn, Stoneyford, Cairncastle, Drumnasole, Ballymena, Killagan, Capecastle, Bushmills, &c., R.Ll.P.

Derry—Near the leap of Coleraine, Templeton MSS. Frequent about Draperstown, Kilrea, and Garvagh, R.Ll.P.

S. triandra L.

Antrim—Found in a hedge about half-way between Malone and the Falls, and in osier grounds near Portmore Park, Templeton MSS.

S. purpurea L.

Down—Moneyscalp, Crotlieve, and Lisnacree, S. & P. Holywood and Craigavad, R.Ll.P.; S.A.S., *I.N.* 1894. Kilbroney, R.Ll.P.

Antrim—Whitehead (R.Ll.P.), *B.N.F.C.* 1890-1. Broughshane, Rasharkin, Capecastle, Kinbane Head, Bushmills, R.Ll.P.

Derry—Roadsides near Upperlands, and frequent on mountain roads above Draperstown, R.Ll.P.

S. Smithiana Willd.

Down—Several stations in Mourne district, S. & P. Holywood Hills, Ballywalter, Kilkeel, R.Ll.P.

Antrim—Portmore, R.Ll.P.

Derry—Roadsides south of Kilrea, R.Ll.P.

S. aurita L. To 1500 feet in the Mournes, S. & P.

S. caprea L.

Down—Near Rostrevor, Newcastle, Kilbroney River, and Ghann River, S. & P. Holywood Hills, R.Ll.P.

Antrim—Lisburn, Glenarm, Drumnasole, Runabay Head, Rasharkin, &c. R.Ll.P.

S. repens L. To 2000 feet in the Mournes, S. & P.

S. herbacea L. 1700-2790 feet in the Mournes, S. & P.

Down—On most of the Mourne summits, S. & P.

Derry—Mullasturrakeen and Mullaghclogher, R.Ll.P.

A Co. Antrim specimen in Herb. D.M. is labelled "Slievenanee" not "Slievenamon," which is no doubt a misprint in *Cybele Hibernica*.

Populus tremula L. To 1200 feet in the Mournes, S. & P.

Down—Cliffs south of Blue Lough, S. & P. On rough ground and railway cuttings south of Crossgar, R.Ll.P.

Antrim—Cliffs of Knockagh and Garron Point, and near source of Braid River, and refound on Rathlin, R.Ll.P.

Derry—Among rocks between Kilrea and Garvagh, R.Ll.P.

Myrica gale L. To 1400 feet in the Mournes, S. & P.

Betula glutinosa Fries. To 1400 feet in the Mournes, S. & P.

Down—Frequent in Mourne Mountains, S. & P.

Antrim—Glenariff, Shoolbred *I.N.* Ram's Island, R.Ll.P.

var. β. **B. pubescens** Ehr.

Antrim—Glenariff and Glendun, Shoolbred *I.N.*

Quercus robur L. To 1300 feet in the Mournes, S. & P.

Corylus avellana L. To 1000 feet in the Mournes, S. & P.

CONIFERÆ.

Taxus baccata L.

Antrim—Rocks in the little Deerpark, Glenarm, and on the Cave Hill, 1836, Herb. D.M. Certainly not now on Cave Hill, S.A.S.

Juniperus nana Willd. To 2000 feet in the Mournes, Hart *R.I.A.* 1000-2000 feet in the Mournes, S. & P.

Down—Local in the Mourne Mountains, S. & P.

Antrim—Refound in Glenariff, R.Ll.P.

Derry—Refound on Benevenagh (R.Ll.P.), *B.N.F.C.* 1892-3.

Juniperus sabina L. Templeton suggests in his MSS. that *Lycopodium alpinum*, "which is named by many people Mountain Savin," was the plant intended by Harris (see *Flora N.E.I.*, p. 301).

HYDROCHARIDACEÆ.

Hydrocharis morsus-ranæ L.

Antrim—Bogholes at Gawley's Gate, 1½ miles west of its Portmore habitat, R.Ll.P., *B.N.F.C.* 1892-3. Introduced at Cushendun by S. A. Brenan.

ORCHIDACEÆ.

Orchis incarnata L.

Down—Near Kilkeel, and by Kilkeel River under Slieve Bingian, S. & P.

Antrim—Stoneyford, Crumlin, and shores of Lough Beg, R.Ll.P.

Derry—Maghera, Kilrea, Garvagh, R.Ll.P.

O. pyramidalis L.

Antrim—Sparingly on chalk rubbish at Magheragall quarries near Lisburn, R.Ll.P., *B.N.F.C.* 1890-1.

Derry—In some abundance at the eastern end of Magilligan strand, Mrs. Leebody; R.Ll.P., *B.N.F.C.* 1892-3.

The single specimen that Dr. Moore found at Magilligan (*Cybele Hibernica*) was no doubt native, and was the first discovery of the species in the district.

Gymnadenia conopsea (L.) R.Br.

Antrim—Glynn, Herb. D.M. Cairncastle and Giant's Causeway, R.Ll.P.

Derry—Between Portstewart and Portrush, R.Ll.P.

G. albida (Swartz) Rich.

Down—Conlig Hill, R.Ll.P.; S.A.S., *I.N.* 1894.

Antrim—On Carrickfergus Commons, and near Ballycastle, Herb. D.M. Glenariff, S. A. Brenan, and refound on Squire's Hill by W. H. Patterson; S.A.S., *I.N.* 1894. White Mountain above Lisburn, R.Ll.P.

Habenaria viridis (L.) R.Br.

Down—North of Annalong, and in Kilbroney valley, S. & P. Conlig Hill, R.Ll.P.

Antrim—Glendun, S. A. Brenan. Carnaneigh, Binnagee, Dunloy, Knocklayd, and common about Stoneyford, R.Ll.P.

Derry—Benevenagh, R.Ll.P., *B.N.F.C.* 1892-3. Abundant from Benevenagh to Benbradagh, Mrs. Leebody. Maghera, Kilrea, Garvagh, and near Sconce Hill, R.Ll.P.

H. bifolia R.Br.

Down—North of Annalong, and in the Kilbroney valley, S. & P.

Antrim—Cushendun, S. A. Brenan. Killagan, Causeway headlands, and common about Stoneyford, R.Ll.P.

Derry—Enagh Lough, Mrs. Leebody; S.A.S., *I.N.* 1894. Near Dungiven, Mrs. Leebody. Near Kilrea and Sconce Hill, R.Ll.P.

H. chlorantha Bab.

Down—Frequent in the Mournes district, S. & P.

Antrim—Glenariff, Shoolbred *I.N.* Dunloy, Rasharkin, and common about Stoneyford, R.Ll.P.

Derry—Common in north Derry, Mrs. Leebody. Common in the Bann valley, R.Ll.P.

Spiranthes Romanzoviana Cham.

Derry—Near Kilrea, Mrs. Leebody; *I.N.* 1893, and R.Ll.P. in *Journ. Bot.* 1893.

This extremely rare plant, the best addition to the flora of the north-east which we have to record, grows here in some abundance in meadows, which should be described as damp pasture, rather than worn-out bog. It should be looked for in similar situations elsewhere in the Bann valley. The counties of Armagh and Cork are its only other stations in Europe.

Listera cordata (L.) R.Br.

Down—Slieve Bearnagh, Eagle Mountain, Carn Mountain, Slieve Lough Shannagh, S. & P.

Antrim—On the Garron plateau, R.Ll.P.

Derry—Benevenagh, Mrs. Leebody.

Neottia nidus-avis (L.) Rich.

Antrim—Glenariff, (R.Ll.P.), *B.N.F.C.* 1889-90. Whitehall near Broughshane, S. A. Brenan.

Derry—Wood below Benevenagh (Miss Knowles), *B.N.F.C.* 1892-3.

Epipactis latifolia (L.) Swartz.

Down—Dromantine demesne, H.W.L.

Antrim—Near Ballymena, S. A. Brenan.

ALISMACEÆ.

Sagittaria sagittifolia L.

Antrim—Crumlin Waterfoot, R.Ll.P.

Butomus umbellatus L.

Down—Still at Lough Leagh, (R.Ll.P.), *B.N.F.C.* 1891-2.

Antrim—Mouth of Six-mile water, W. S. Smith. Crumlin waterfoot, Miss Knowles. Recently introduced at Langford Lodge from the Lagan, S.A.S.

LILIACEÆ.

Scilla verna L.

Down—Abundant Ardglass to Killough, R.Ll.P.

Antrim—Still abundant on Rathlin, R.Ll.P., *B.N.F.C.* 1889-90.

Allium ursinum L.

Down—Mourne Park, Bloody Bridge, Tollymore Park, S. & P. Dundonald and Downpatrick, R.Ll.P.

Derry—West of Downhill, Mrs. Leebody.

JUNCACEÆ.

Juncus maritimus Sm.

Antrim— Sparingly at the Giant's Causeway, Herb. D.M.

J. effusus L. To 1837 feet in the Mournes, S. & P.

J. glaucus (Huds.) Ehr.

Down—Waste ground behind Queen's Island Shipyard, W. D. Donnan.

Antrim - Cushendun, S. A. Brenan. Ballycarry, Glynn, Langford Lodge, R.Ll.P.

J. obtusiflorus Ehr.

Down—Marshy places on the Downs at Ardglass, C.H.W. Refound at Dundrum Bay, by the railway ¾ mile north of Dundrum, S.A.S.

J. acutiflorus Ehr. To 1900 feet in the Mournes, S. & P.

J. supinus Moench. To 2000 feet in the Mournes, S. & P.

Down—Frequent in the Mournes. A submersed very slender form, many feet in length, grows in the lakes and streams in up to 4 feet

of water, S. & P. Aughnadanagh Lake near Saintfield (approaching var. *subverticillatus*), C.H.W., *Watson B.E.C.* 1893.

Antrim—Slatt, Ballee, and Glenariff, Miss Knowles. Bogs near Rasharkin and Dervock, R.Ll.P.

Derry—Limavady, Mrs. Leebody. Common about Maghera, Kilrea, Garvagh, and Coleraine, R.Ll.P.

J. squarrosus L. To 2510 feet in the Mournes, S. & P.

TYPHACEÆ.

Typha latifolia L.

Down—Site of Moneyscalp Lake, Warrenpoint town reservoir, Narrow-water demesne, S. & P. Meenan Bog near Loughbrickland, H.W.L. Bangor, Portavoe, Seaforde, Loughinisland, R.Ll.P.

Antrim—Bush River, R.Ll.P.

Derry—Drains at Ballyscullion, Mrs. Leebody.

T. angustifolia L.

Down—In Lough Neagh at mouth of Lagan Canal, R.Ll.P., *B.N.F.C.* 1892-3. Still abundant in Lough Henney, C.H.W. Abundant in Derry Lough near Ballynahinch, S.A.S.

Sparganium ramosum Huds. var. *b.* **microcarpum** Neuman.

Down—Loughinisland, C.H.W.

S. simplex Huds.

Down—Near Kilkeel, Newcastle, and Warrenpoint, S. & P. Loughinisland (R.Ll.P.), *B.N.F.C.* 1889-90. Moira, C.H.W. Comber, R.Ll.P.

Antrim—Bush River, R.Ll.P.

Derry—Kilrea, Mrs. Leebody. Near Portglenone, R.Ll.P.

S. natans L.

Down—Altnadua Lake, S. & P.

Antrim—In the Lagan, between the first and second locks, R.Ll.P.

S. minimum Fr.

Down—Milltown near Warrenpoint, S. & P. Small lake near Crossgar, C.H.W.

Antrim—Bog-holes west of Scawt Hill, R.Ll.P.; S.A.S., *I.N.* 1894. Near Parkmore, S. A. Brenan.

ARACEÆ.

Acorus calamus L. Quite naturalised throughout the course of the Lagan Canal.

Arum maculatum L. To 1000 feet in the Mournes, S. & P.

POTAMOGETONACEÆ.

Potamogeton polygonifolius Pourr. 1550 feet in the Mournes, Hart *R.I.A.*

P. rufescens Schrad.

Down—Lake (Ballykine Lough), Ballynahinch, R.Ll.P.; *Watson B.E.C.* 1891-2. Burren River near Newcastle, S. & P.

P. nitens Weber.

Down—Annsboro Lake, S.A.S., *I.N.* 1894.

Antrim—Six-mile water near Antrim, S.A.S., *I.N.* 1894.

P. lucens L.

Derry—Magilligan, Mrs. Leebody.

var. c. **longifolius** Gay.

Antrim—Washed ashore at Crumlin Waterfoot, S.A.S.

P. undulatus Wolfg. (= *P. perfoliatus* x *crispus*).

Antrim—In the Six-mile River above Templepatrick, S.A.S., 1882-94. An infertile hybrid which grows in abundance at junction with Doagh River and other places, *vide* Bennett, *Journ. Bot.* 1894, and S.A.S., *I.N.* 1894.

P. Zizii Roth.

Down—Lagan Canal near Blaris, S.A.S.

Antrim—Lough Neagh at Cranfield, S.A.S.

Derry—Bann at Kilrea, Mrs. Leebody.

P. obtusifolius M. & K.

Down—Loughinisland, R.Ll.P.

Derry—Killelagh Lake above Maghera, R.Ll.P.

P. pectinatus *L.*

Down—Clandeboye Lakes, R.Ll.P.

Antrim—Quarry pools at Magheragall near Lisburn, R.Ll.P.

Derry—Eglinton, Mrs. Leebody.

Ruppia maritima L.

Derry—Carrickhue, Mrs. Leebody.

R. rostellata Koch.

Down—Stream at Blackstaff Bridge near Kirkcubbin, R.Ll.P.

Zannichellia palustris L.

Down—Stream at Blackstaff Bridge near Kirkcubbin, R.Ll.P.

Derry—Common in the Bann from Coleraine to the sea, R.Ll.P.

CYPERACEÆ.

Schœnus nigricans L. To 1800 feet in the Mournes, S. & P.

Antrim—Lough Naroon, R.Ll.P.

Cladium mariscus (L.) R.Br.

Down—Sparingly on northern margin of Altnadua Lake near Castlewellan, S. & P. This is no doubt Templeton's station, the location of which is discussed in *Flora*; the plant was thought to be extinct in N.E. Ireland.

Antrim—In Lough Neagh at Portmore, Templeton MSS. Appears to be now extinct at Lough Neagh.

Rhynchospora alba (L.) Vahl. 350-1225 feet in the Mournes, S. & P.

Down—Pools by Kilkeel River under Slieve Bingian; near Colligan Bridge; base of Slieve-na-brock; and near Cove Mountain, S. & P.

Antrim—"With ripe seeds gathered in a bog near Ballycastle, 1797," R. Brown. Bogs around Ballymoney [still there, R.Ll.P.], and frequent in flow bogs in the north of the county, Herb. D.M.

var. **β. sordida.**

Antrim—Bog near Ballymena, Miss Knowles.

Eleocharis acicularis (L.) Sm.

Down—Shores of Lough Neagh at Anadroghal, H.W.L.

Derry—Lough Neagh near Toome, and abundant in the centre of Lough Beg, R.Ll.P., *Journ. Bot.* 1893. The plant appears to grow everywhere on the sandy bottom of Lough Beg in up to four feet of water, and over an area of several square miles. This submerged form has short, straight stems, and is always barren, R.Ll.P. (See *Journ. Bot.* 1893.)

Scirpus maritimus L.

Down—Mill Bay and above Warrenpoint, S. & P.

S. sylvaticus L.

Down—Tollymore Park, S. & P. Ballydugan Lake and near Killyleagh, R.Ll.P.

Antrim—Broughshane, and by the Bann occasionally, R.Ll.P.

Derry—In several places by the Bann, Mrs. Leebody and R.Ll.P.

S. lacustris L.

Down—Ballydugan and Killyleagh, R.Ll.P.

Antrim—Near Broughshane, Herb. Canon Grainger. Several places in Main River, Miss Knowles and R.Ll.P. Rathlin Island, R.Ll.P.

S. Tabernaemontani Gm.

Derry—Near Culmore, Mrs. Leebody.

S. pauciflorus Lightf.

Down—Between Dunny Water Bridge and Annalong, Hart *R.I.A.*

Antrim—Rathlin Island, S.A.S.

Derry—Sandy shore of the Bann near its mouth, R.Ll.P.

S. fluitans L.

Down—Hilltown, Shimna River, Narrow-water demesne, S. & P. Holywood Hills, R.Ll.P.

Antrim—Causeway Headlands, R.Ll.P.

S. setaceus L.

Down—Tollymore Park, and source of Kilbroney River, S. & P. Saintfield, C.H.W. Carngaver and Ballynahinch, R.Ll.P.

Antrim—Glenoe, Herb. D.M. Near Fair Head, and between Ballycastle and Ballintoy, Shoolbred *I.N.* Bushfoot, R.Ll.P.

Derry—Limavady and Enagh Lough, Mrs. Leebody. Garvagh, R.Ll.P.

S. Savii S. & M. 820 feet in the Mournes, Hart *R.I.A.*

Down—Glasdrumman, Dunny Water Bridge, White Water, Kilkeel, Narrow-water, S. & P. Victoria Park, R.Ll.P.

Derry—Castlerock, R.Ll.P.

Elysmus rufus (Huds.) Link.

Down—Grey Point, and abundant from Kilclief to Strangford, R.Ll.P.

Eriophorum polystachion L. var. γ. **elatius** Koch.

Antrim—Bogs at Slatt and Ballee near Ballymena, Miss Knowles. Fine specimens, over 3 feet in height.

Carex dioica L.

Antrim—Abundant through the parish of Ramoan, Herb. D.M.

C. pauciflora Lightf.

Antrim—Bog above Glenariff, 1889, H.W.L. An interesting and welcome addition to the Irish flora.

C. distichа Huds.

Down—Near Crossgar, C.H.W.

Antrim—Salt marshes by Larne Lough, Herb. D.M. Rathlin Island, R.Ll.P., *I.N.* 1893. Common where the Bann leaves Lough Beg, R.Ll.P.

C. arenaria L.

Antrim—Cushendun, White Park Bay, Bushfoot, Portrush, R.Ll.P.

C. vulpina L.

Down—Mill Bay and Narrow-water, S. & P. Ardglass (R.Ll.P.), *B.N.F.C.* 1892-3. Holywood and Sketrick, R.Ll.P.

Antrim—Frequent along the shores of Islandmagee, Herb. D.M. Whitehead, H.W.L.

Derry—Eglinton, Mrs. Leebody. Bann mouth, R.Ll.P.

C. muricata L.

Antrim—Marshy pasture between Springfield Road and the Forth River above Clowney Bridge, Richd. Hanna; S.A.S., *I.N.* 1894.

C. teretiuscula Good.

Derry—Abundant on marshy margin of Killelagh Lough above Maghera, Mrs. Leebody and R.Ll.P. This plant was believed to be extinct in the district.

C. paniculata L.

Antrim—Grange of Killagan, and Parish of Aghagallon, Herb. D.M. Near Muckamore, B.N.F.C.; *I.N.* 1893. Ram's Island, H.W.L. Portmore Lake, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

C. canescens L.

Down—Carngaver, R.Ll.P.

Antrim—Killagan, and bogs above Dunloy and Rasharkin, R.Ll.P.

Derry—Near Kilrea, Mrs. Leebody.

C. leporina L.

Down—Sparingly on the lower grounds of Mourne district; abundant around Lough Island Reavy, S. & P. Aghaderg, H.W.L. Victoria Park, W. D. Donnan. Conlig, Killinchy, Downpatrick, R.Ll.P.

Antrim—Ballee and Cullybackey, Miss Knowles. Killagan and Dunloy, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

C. stricta Good.

Antrim—Side of Lough Neagh at Shane's Castle, Herb. D.M. Abundant and luxuriant on several spots around Portmore Lough, and islet on Antrim side of Lough Beg, R.Ll.P.; S.A.S., *I.N.* 1894. Frequent where the Bann leaves Lough Beg, and again half-way to Portglenone, and abundant on the river edge for half-a-mile at Portglenone House, R.Ll.P.

Derry—Side of the Bann near Coleraine, Herb. D.M. [Still there, below the town, R.Ll P.] Side of the Bann below Toome, R.Ll.P.; S.A.S., *I.N.* 1894. By the Bann at Kilrea, Mrs. Leebody.

This plant, for which in *Flora* only Templeton's notes could be quoted, is thus abundantly restored to its place in our flora.

C. acuta L.

Antrim—Banks of the River Main, near Ballandraid, Herb. D.M.

C. rigida Good. Dr. Dickie's record, "Summit of Slieve Donard," was certainly an error, S. & P.

C. aquatilis Wahl. var. **elatior** Bab.

Antrim—Ditch by the Main River in Shane's Castle Park, R.Ll.P., *Journ. Bot.* 1892. See also A. Bennett in *I.N.* 1892.

C. Goodenovii Gay. To 1450 feet in the Mournes, Hart *R.I.A.*; to 1400 feet, S. & P.

C. pallescens L.

Down—Tollymore Park, S. & P. Dundrum and Saintfield, C.H.W. Aghaderg, H.W.L.

Derry—Kilrea, R.Ll.P.

C. limosa L.

Down—Plentiful in a wet marsh on Saul Camp ground at Downpatrick, R.Ll.P., *B.N.F.C.* 1892-3.

Antrim—Bog east of Killagan railway station, margins of Lough Naroon, and still frequent on wet bogs above Rasharkin, R.Ll.P.

Derry—Margins of Lough Ouske in the Sperrin Mountains, R.Ll.P. *Journ. Bot.* 1892.

C. strigosa Huds.

Antrim—Near Muckamore, B.N.F.C.; *I.N.* 1893.

C. pendula Huds.

Antrim—Glenariff, Shoolbred *I.N.* Langford Lodge, H.W.L. Woodburn Glen, R.Ll.P.

C. præcox Jacq.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-90.

Derry—Near Bellarena, Mrs. Leebody. Kilrea, R.Ll.P.

C. pilulifera L.

Antrim—Glenariff, Shoolbred *I.N.*

C. glauca Scop. To 2510 feet in the Mournes, S. & P.

C. Œderi, *auct. plur.*

Down—Aughnadarragh Lake, C.H.W.; *Watson B.E.C.* 1893-4. By Pollramer Lake, S.A.S.

C. extensa Good.

Down—By the Quoile below Downpatrick, R.Ll.P.

Derry—Coleraine, Mrs. Leebody. Bann mouth, R.Ll.P.

C. Hornschuchiana Hoppe. To 1700 feet in the Mournes, S. & P.

Down—Between Dunny Water Bridge and Annalong, Hart *R.I.A.* Frequent on the Mournes, S. & P. Carngaver, R.Ll.P.

Antrim—Glenshesk, bogs above Agnew's Hill, and head of Glenariff, Herb. D.M. Bogs above Dunloy and Rasharkin, R.Ll.P.

Derry—Killelagh Lough above Maghera, and near Kilrea, R.Ll.P.

C. distans L.

Down—South of Rostrevor, S. & P.

Antrim—Below Cushendall, Herb. D.M.

Derry—Near Portstewart, Mrs. Leebody. Bann mouth, R.Ll.P.

C. binervis Sm. To 2394 feet on the Mournes, S. & P.

C. lævigata Sm.

Down—Between Dunny Water Bridge and Annalong, Hart *R.I.A.* Mourne Park, S. & P. Kilmore near Crossgar, C.H.W., *Watson B.E.C.* 1893-4.

Derry—Dungiven, Mrs. Leebody.

C. filiformis L.

Antrim—A fine specimen is in Herb. D.M., labelled "At Selchin new deer park, side of Lough Neagh, July, 1832." This plant, which is included among the "Plants erroneously recorded" in *Flora*, must therefore be restored to its place in our flora, though it is feared it is now extinct, through drainage, along with *C. elongata*, which grew at the same place.

C. hirta L.

Down—White Water, S. & P. Aghaderg and Tullyliah, H.W.L. Cultra, R.Ll.P.

Antrim—Shane's Castle, W. D. Donnan. Glenarm, R.Ll.P.

Derry—Maghera, Mrs. Leebody. Bellarena, W. Kennedy. Kilrea, R.Ll.P.

C. rostrata Stokes. To 1150 feet in the Mournes, Hart *R.I.A.*; also S. & P.

var. β. **robusta** Sonder.

Down—Brown Bog near Loughbrickland, H.W.L.

C. vesicaria L.

Down—Pollramer Lake, C.H.W. Brown Bog near Loughbrickland, H.W.L.

Antrim—Cushendall, and abundant by the Bann at Portglenone House, and at its outflow from Lough Beg, R.Ll.P.

Derry—By the Bann at Kilrea, Mrs. Leebody.

C. paludosa Good.

Derry—Side of the River Bann below Coleraine, Herb. D.M.

C. riparia Curt.

Antrim—Still at Portmore, by the Tunny drain, R.Ll.P.

Derry—Abundant in several spots on south bank of Bann, between Coleraine and the sea, R.Ll.P.

GRAMINEÆ.

Anthoxanthum odoratum L. To 2394 feet in the Mournes, S. & P.

Alopecurus pratensis L.

Down—Donaghadee, S.A.S., *I.N.* 1894.

Antrim—Stranmillis, Ballygomartin, and roadside beyond Ligoniel, S.A.S.

Nardus stricta L. To 2449 feet in the Mournes, S. & P.

Milium effusum L.

Down—Wooded shore of lough south of Rostrevor, S. & P. Drumcro and near Magheralin, C.H.W.

Antrim—Collon [Colin] Glen, near the large waterfall, Herb. D.M.

Phragmites communis Trin.

Down—Common in Mourne district, S. & P. Holywood and Newtownards, R.Ll.P.

Antrim—Shane's Castle, wet bogs above Dunloy and Rasharkin, and frequent in Lough Beg, and by the Bann from Lough Beg to the sea in Antrim and Derry, R.Ll.P.

Calamagrostis epigejos Roth. Searched for at Formoyle Hill by Mrs. Leebody in 1893, and by Mrs. Leebody, Miss Knowles, and R.Ll.P. in 1894, without success; apparently extinct there.

C. Hookeri Syme.

Antrim—On the shore of Lough Neagh occasionally all the way from Toome Bridge to Antrim, Herb. D.M.

Coney Island was inadvertently printed in *Flora* for Church Island. Searched for here by R.Ll.P. in 1893, without success; the place is now close-cropped pasture.

Agrostis canina L. To 2300 feet on the Mournes, S. & P.

Down—Common in the Mourne district, S. & P. Ballyalloly, and hills above Dundonald, S.A.S.

Antrim—Mazetown, Castle Upton, and Crumlin Waterfoot, S.A.S.

A. vulgaris With. var. β. **A. pumila** Lightf. 1200–1600 feet in the Mournes, S. & P.

Down—Slieve Bingian and Eagle Mountain, S. & P.

Antrim—Ballycastle, R.Ll.P.

Derry—Benevenagh, R.Ll.P., *B.N.F.C.* 1892-3. Near Maghera and Kilrea, sand-dunes at Bann mouth, and fields at Magilligan, R.Ll.P.

A. alba L. To 2055 feet on the Mournes, S. & P.

Holcus lanatus L. To 1350 feet on the Mournes, S. & P.

H. mollis L.

Down—A tall (4 feet) slender form at White Water, S. & P. Castlewellan Park, S.A.S.

Derry—Limavady, Mrs. Leebody. Kilrea, R.Ll.P.

Aira flexuosa L. To 2790 feet on the Mournes, Hart *R.I.A.*, also S. & P.

Down—Common on the Mournes, S. & P. Hills above Dundonald, S.A.S.

Antrim—Above Dunloy and Rasharkin, R.Ll.P.

Derry—Benevenagh and Benbradagh, S.A.S. Garvagh, R.Ll.P.

A. præcox L. To 1662 feet on the Mournes, S. & P.

Trisetum flavescens (L.) Beauv.

Down—Killyleagh (R.Ll.P.), *B.N.F.C.* 1891-2. Marino, Cultra, New townards, R.Ll.P.

Antrim—Plenty near Antrim and Ballinderry, Herb. D.M. Lisburn Park, Greenisland, Carrickfergus, R.Ll.P.

Derry—On a wall at Garvagh, R.Ll.P.

[**Avena fatua** L.

Antrim—Rubbish heaps at Springfield, Belfast, with other casuals, S.A.S.]

[**A. strigosa** Schreb.

Antrim—Frequent near Clogh Mills, Herb. D.M.]

A. pubescens L.

Down—Shore at Craigavad, R.Ll.P.; S.A.S., *I.N.* 1894. Holywood, W. D. Donnan. Not found by S. & P. at Newcastle (Templeton's station).

Antrim—Cliffs of Cave Hill, and in Parkmore wood, S.A.S.

Triodia decumbens Beauv.

Derry—Mourne district frequent, S. & P. Near Lough Shark, H.W.L. and C.H.W.

Antrim—Glenariff, Shoolbred *I.N.* Cushendun, Dunloy, R.Ll.P.

Derry—Maghera, Kilrea, Garvagh, Bann mouth, R.Ll.P.

Koehleria cristata (L.) Pers.

Antrim—Dry, sandy ground at Cushendall, Herb. D.M. Still at Giant's Causeway, and still on Islandmagee, growing 3 feet high at the Rocking-stone, R.Ll.P.

Melica uniflora Retz.

Down—Frequent in Mourne district, S. & P. Downpatrick, R.Ll.P.

Antrim—Glenariff, H.W.L. Carnlough and Shane's Castle, R.Ll.P.

Derry—Garvagh, Mrs. Leebody. Kilrea, R.Ll.P.

Molinia cærulea Schreb. To 2449 feet on the Mournes, S. & P.
Antrim—Bogs at Killagan and above Dunloy, R.Ll.P.

Poa annua L. To 2450 feet on the Mournes, S. & P.

P. pratensis L. To 1350 feet on the Mournes, S. & P. We could not find it on summit of Slieve Donard, whence it is recorded with a ? by Dickie *(Flor. Ulst.)*, and apparently copied from this work (but without the ?) into *Cybele Hibernica* and Mr. Hart's *Report*, R.I.A. 1891; and we believe this note to be a mistake.

Glyceria fluitans (L.) R.Br. To 1150 feet in the Mournes, S. & P.

Schlerochloa distans (L.) Bab.
Down—Warrenpoint, S. & P.

S. rigida (L.) Link.
Down—Walls by the sea at Ardglass and Killough, R.Ll.P., *B.N.F.C.* 1892-93.
Antrim—Wall top at Magheramorne railway station, R.Ll.P.

S. loliacea (Huds.) Woods.
Down—White Water, and near Newcastle, S. & P. By Ballydugan Lake, R.Ll.P.
Antrim—Redbay, Cushendun, and still at Ballycastle and Olderfleet, R.Ll.P.

Briza media L.
Down—Narrow-water, S. & P. Newcastle, C.H.W. Killinchy, R.Ll.P.

Catabrosa aquatica Beauv.
Down—Saintfield, D. Redmond.
Antrim—Dervock, R.Ll.P.
Derry—Lignapeiste Glen, Mrs. Leebody. Near Upperlands and Maghera, Miss Knowles. Near Garvagh, R.Ll.P.

Festuca sciuroides Roth.
Down—Near Warrenpoint, S. & P. Rostrevor, H.W.L. Downpatrick, and still at Holywood, R.Ll.P.
Antrim—Randalstown, W. D. Donnan.

F. ovina L. Type ascends to 1500 feet, and viviparous form ranges from 200 to 2796 feet on the Mournes, S. & P.
var. β. **F. tenuifolia** Sibth.
Down—Cliffs of Slieve Muck, at 1500 feet, S.A.S.

var. γ. **F. duriuscula** L.

Antrim—Frequent in meadows throughout the Co. of Antrim, especially along the shores of L. Neagh, Herb. D.M. Glenariff, Shoolbred *I.N.* Knockagh, R.Ll.P.

F. rubra L. To 1600 feet in the Mournes, S. & P.

F. sylvatica Vill.

Down—Abundant and luxuriant by the Shimna and Spinkwee Rivers in Tollymore Park, S. & P.

F. gigantea Vill.

Down—Moygannon Glen, Mourne Park, Tollymore Park, S. & P. Holywood Waterworks, R.Ll.P.

Antrim—Crumlin Waterfoot, S.A.S. Massereene Park, R.Ll.P.

Derry—Magilligan, Mrs. Leebody.

F. arundinacea Schreb.

Down—Tollymore Park, S. & P. Dundrum, R.Ll.P.

Antrim—Templepatrick and Knockagh, S.A.S. Island at north end of Lough Beg, Mrs. Leebody. Bushfoot, R.Ll.P.

Derry—Upperlands, Kilrea, and Magilligan, R.Ll.P.

Bromus sterilis L.

Down—Abundant from Killowen to Seafield, and sparingly at Warrenpoint, S. & P. Killowen church at Killyleagh, (R.Ll.P.), *B.N.F.C.* 1891-2.

Antrim—Roadside between Ballycastle and the sea, R.Ll.P.

For "railway bank" at Marino in *Flora* read "railway bridge."

B. racemosus L.

Down—Holywood, R.Ll.P.

Antrim—Whitewell, R.Ll.P.

[**B. secalinus** Bab.

Antrim—Waste ground at Duncrue Street, Belfast, and hedge-bank at Magheragall near Lisburn, R.Ll.P.]

Triticum caninum L.

Down—Shore a mile south of Newcastle, and near Kilkeel, S. & P. Sandy shore at Groomsport, S.A.S.

T. acutum DC.

Down—Gravelly shore of Ballyhornan Bay, S.A.S.

Antrim—Sandy shore, Red Bay, Shoolbred *I.N.*

T. junceum L.

Down—Kilkeel and Greencastle, S. & P.

Antrim—Ballycastle, R.Ll.P.

[**Hordeum murinum** L.

Antrim—Garron Point, 1861, H.W.L.]

Lepturus filiformis Trin.

Down—Between Warrenpoint and Narrow-water, H.W.L.

Antrim—Shores at Larne Lough plentifully, Herb. D.M.

[**Lolium temulentum** L.

Antrim—Near Larne, Herb. D.M.

Derry—Near Limavady, Mrs. Leebody.]

CRYPTOGAMIA.

EQUISETACEÆ.

Equisetum pratense Ehr.

Antrim—Glenocum; plentiful in a small glen branching off Glenbush, near the head of the latter, Herb. D.M. Carnlough, Herb. Canon Grainger. Glen on north side of Garron Point, R.Ll.P.

E. sylvaticum L. To 1000 feet in the Mournes, S. & P.

Down—Frequent in Mourne district, S. & P.

Antrim—Rasharkin, and from Ballymoney to Ballycastle, R.Ll.P.

Derry—Near Londonderry, Mrs. Leebody. Kilrea and Garvagh, R.Ll.P.

E. limosum L. To 1000 feet on the Mournes, S. & P.; to 1000 feet on Garron Point, R.Ll.P.

E. palustre L., var. **β. polystachium.**

Antrim—Portrush sandhills, and sandy shore of Lough Neagh at Shanes' Castle, R.Ll.P.

var. γ. **nudum** DC.

Antrim—Sandy shore of Lough Neagh at Shane's Castle, R.Ll.P.

S. hyemale L. To 1700 feet on the Mournes (C.H.W.), S. & P.

Down—By Kilbroney River, Yellow Water, Rocky River near Hilltown, Annalong River, and on Thomas Mountain (C.H.W.), S. & P. Near Edenderry, Templeton MSS.; refound here by R.Ll.P., on the edge of the Lagan; *B.N.F.C.* 1892-3. On the Lagan side half way between Shaw's Bridge and Drum Bridge [? Down or Antrim], Templeton MSS.

Antrim—Cullybackey, Herb. Canon Grainger. Glen above Hightown, north of Squire's Hill, C.H.W. By the Glenarm River above Park mill, and northern branch of Glenariff, R.Ll.P., *B.N.F.C.* 1892-3.

Derry—Glen near Magilligan, Mrs. Leebody.

S. trachyodon A. Braun.

Antrim—Glenariff, Herb. D.M.

Derry—Refound in Ballyharrigan Glen, Mrs. Leebody.

FILICES.

Cryptogramme crispa R.Br. 1200-1700 feet on the Mournes, S. & P.

Down—Extremely rare, but seen in four of its half-dozen known Mourne stations by S. & P.

Polypodium vulgare L. To 2449 feet on the Mournes, S. & P.

P. phegopteris L. To 2250 feet in the Mournes, Hart *R.I.A.* 800-2000 feet on the Mournes, S. & P.

Down—Frequent on the Mournes; some 20 stations are given by S. & P.

Antrim—Glencloy, R.Ll.P.

P. dryopteris L. Searched for on Knocklayd by S.A.S. in 1882, and by R.Ll.P. in 1892 and 1894, but without success. A more unlikely habitat for this fern than the bare slopes of Knocklayd could not be imagined, but Dr. Moore's record is supported by specimens in his herbarium. Could it have been planted there, as *P. Robertianum* was on Carlingford Mountain (*I.N.* 1893, p. 22)?

astrea thelypteris Presl.

Antrim—Portmore Lough, Selohin, side of Lough Neagh, Herb. D.M.—additional notes which go to show the abundance of this fern before drainage operations destroyed it.

L. oreopteris (Ehr.) Presl. 20-2000 feet on the Mournes, S. & P.

Down—A number of Mourne stations are given by S. & P., but the plant grows chiefly on the lower grounds of the northern slope, from Slieve Donard to Slievenaman.

Derry—By the Glenomna water, and on roadside above Upperlands, R.Ll.P.

L. filix-mas (L.) Presl. To 1500 feet on the Mournes, S. & P.

var. β. **L. Borreri** Newm.

Common throughout the three counties, R.Ll P.

var. δ. **L. abbreviata** DC.

Down—Abundant on cliffs of Eagle Mountain, 1300-1500 feet, S. & P.

L. spinulosa (Roth) Presl.

Derry—On bogs two miles south of Kilrea, R.Ll.P. Refound by the Roe above Limavady, Mrs. Leebody.

L. dilatata (Willd.) Presl. To 2449 feet on the Mournes, S. & P.

L. remula Brack. 100-1430 feet on the Mournes, S. & P.

Down—Local in Mourne district. S. & P. Saintfield, C.H.W. SEED

Antrim—Glendun, S. A. Brenan. Roadside south of Bushmills, R.Ll.P.

Derry—By the Roe above Limavady, Mrs. Leebody.

Polystichum aculeatum (L.) Roth.

Down—Craigauntlet and Killinchy, R.Ll.P.

Antrim—Shane's Castle and Dunloy, R.Ll.P.

Cystopteris fragilis (L.) Bernh. 800—2000 feet on the Mournes, S. & P.

Down—Along the Slieve Muck ridge, S. & P.

Antrim—North base of Knocklayd, Herb. D.M. Glenshesk, J. H. Davies.

Derry—Cliffs of Benevenagh, Shoolbred *I.N.* Old wall at Kilrea, Mrs. Leebody.

Athyrium filix-fœmina (L.) Roth. To 2449 feet on the Mournes, S. & P.

Asplenium adiantum-nigrum L. To 1500 feet on the Mournes, S. & P. Common throughout the district—a long list of further localities might be given.

var. β. *A. acutum* Bory. The Benevenagh plant of *Flora*, though a very acute form of *A. adiantum-nigrum*, cannot be correctly placed here. Sherard's Mourne Mountain plant (Herb. Oxon. and *Raii Synopsis*) is a barren plumose form of *Athyrium filix-fœmina*, the same as that known to fern growers as *kalothrix*, S. & P.

A. trichomanes L. To 1600 feet on the Mournes, S. & P.

Down—Frequent throughout the Mournes, S. &. P. Crawfordsburn, R.Ll.P.

Antrim—White Park Bay and Giant's Causeway, R.Ll.P.

Derry—By the Roe above Limavady, Mrs. Leebody.

A. marinum L.

Derry—Benevenagh Cliffs, Shoolbred *I.N.*

A. ruta-muraria L. Growing on trap-rock on Benevenagh, R.Ll.P., *B.N.F.C.* 1892-3, and the same at Fair Head, R.Ll.P.

Ceterach officinarum (L.) Willd.

Down—Near Clough, *B.N.F.C.* 1889-90. Maryfield near Holywood, W. H. Patterson. Ringdufferin, J. Wilson. Larchfield near Legacurry, J. H. Davies. Ardilea House near Dundrum, R.Ll.P.

Antrim—Glenmore near Lisburn, J. H. Davies. Bridge in Glendun, S. A. Brenan.

Derry—Wall at Prehen near Londonderry, Mrs. Bernard.

The prevailing form in the district is var. *crenatum* Milde; the type is apparently rare.

Blechnum spicant Roth. To 2449 feet on the Mournes, S. & P.

Pteris aquilina L. To 1450 feet on the Mournes, Hart *R.I.A.*; 1400 feet on the Mournes, S. & P.

Adiantum capillus-veneris L. A sheet of small fronds in Mr. Hanbury's herbarium is labelled "Morne Mns., Co. Down, Ireland." There is no date or collector's name. The sheet has no history, and comes from some old herbarium.

Hymenophyllum tunbridgense (L.) Sm. Ferguson's and Dickie's Mourne plants must have been *H. unilaterale*, S. &. P.

H. unilaterale Willd. To 1750 feet on the Mournes, Hart *R.I.A.*; 150—1500 feet on the Mournes, S. & P.

Down—Some additional Mourne Mountain localities are given by S. & P.

Osmunda regalis L.

Down—West side of Slieve Bingian, and by the Causeway water; still at Bloody Burn and sea-cliffs south of Newcastle; apparently extinct by the Glen River, S. & P.

Antrim—Island of Rathlin, sparingly, and on boggy ground along the side of Portmore Lough, Herb. D.M. Near Whitehall at Broughshane, S. A. Brenan. Still lingers by Lough Neagh at Shane's Castle, R.Ll.P.; S.A.S., *I.N.* 1894.

Derry—By Lough Bran above Maghera, R.Ll.P. Bog two miles east of Kilrea, R.Ll.P.

Botrychium lunaria (L.) Sw.

Down—Bloody Bridge, S. & P. Conlig Hill, R.Ll.P. Tonaghmore Hill near Saintfield, D. Redmond.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-90. Glenariff, S. A. Brenan. Summit of Binnagee near Carnlough, R.Ll.P.

Ophioglossum vulgatum L.

Down—Rostrevor, S. & P. Saintfield, C.H.W. Loughbrickland, H.W.L. Clandeboye demesne, R.Ll.P.

Antrim—Glenmore near Lisburn, J. H. Davies. Glenballyemon, S. A. Brenan. Langford Lodge and Binnagee, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

MARSILIACEÆ.

Pilularia globulifera L.

Antrim—Drain, side of Portmore Lough, Herb. D.M.

LYCOPODIACEÆ.

Isoetes lacustris L. 1100-1350 feet [not 1500] in the Mournes, S. & P. Descends to less than 50 feet in Antrim (Lough Neagh, D.M.).

Down—Blue Lough and Lough Shannagh, S. & P.

Antrim—Shore of Lough Neagh near Toome Bridge and Selchin, and at Lady Bay in parish of Glenavy, Herb. D.M. Craigfad Lough above Carnlough, R.Ll.P.

Lycopodium clavatum L.

Down—One plant on Slieve Donard at 2450 feet, S. & P. Slieve Commedagh, H.W.L.

Antrim—Skerry, Herb. D.M. Evish Mountain near Parkmore, and Glenleslie near Clogh, H.W.L. Summit of Knocklayd, R.Ll.P.

Derry—Crockmore above Draperstown, R.Ll.P., *Journ. Bot.* 1892.

L. alpinum L. 1900-2796 feet on the Mournes, S. & P.

Down—On most of the Mourne summits, S. & P.

Antrim—Near Retreat, S. A. Brenan. Cloughcor above Glenariff, H.W.L. Summit of Trostan, and of Little Trosk above Carnlough, R.Ll.P.

L. selago L. To 2796 feet on the Mournes, S. & P.

Selaginella spinosa Beauv. To 2020 feet on the Mournes, Hart *R.I.A.* 0-2000 feet on the Mournes, S. & P.

Down—Common on the Mournes, S. & P.

CHARACEÆ.

Chara fragilis Desv.

Down—Co. Down [Loughinisland], S.A.S.; H. & J. Groves *Journ. Bot.* 1890. Warrenpoint town reservoir, S. & P. Ballyward Lake and Castlewellan Lake, S.A.S. Bull's Eye near Downpatrick, Clandeboye lakes. Conlig Hill, and Ballygowan quarries, R.Ll.P.

Antrim—Lough Neagh, D. Moore; Groves *I.N.* Boghole above Carnlough, R.Ll.P.

var. **barbata** Gant.

Down—Holywood Hills, R.Ll.P.; Groves *I.N.* South side of Tardree Hill, Herb. Canon Grainger. Clandeboye lower lake, and near Craigauntlet, R.Ll.P.

Antrim—Lough Beg [Portmore Lough], W. Thompson; Groves *I.N.*

var. **Hedwigii** Kuetz.

Down—Holywood Hills, R.Ll.P.; Groves *I.N.*

var. **delicatula** Braun.

Antrim—Ram's Island, H.W.L.

C. aspera Willd.

Down—Money Lake, R.Ll.P.

Antrim—Rathlin, Hb. D. Moore; Groves *I.N.* Lough Beg, R.Ll.P.; Groves *I.N.* (abundant at north end of the lake, R.Ll.P.). In Lough Neagh near Shane's Castle, R.Ll.P.

Derry—Lough Beg, R.Ll.P.; Groves *I.N.*

var. **lacustris** H. & J. G.

Antrim—Lough Neagh, Crumlin, S.A.S.; Groves *I.N.*

var. **subinermis** Kuetz.

Antrim—Rathlin Island, D. Moore; Groves *I.N.* Ram's Island, H.W.L.

Derry—River Bann [below Coleraine], R.Ll.P.; Groves *I.N.*

C. contraria Kuetz.

Down—Clandeboye Lake, R.Ll.P., *B.N.F.C.* 1892-3.

Derry—Brackish pools at Limavady Junction, R.Ll.P. and W. D. Donnan; R.Ll.P., *B.N.F.C.* 1890-1.

C. hispida L.

Down—Downpatrick, R.Ll.P.; Groves *I.N.* It grows here in Money Lake and in the Bull's Eye, R.Ll.P.

Derry—R. Bann, Coleraine, D. Moore; Groves *I.N.* Magilligan, Mrs. Leebody.

var. **rudis** Braun.

Down—Money Lake, R.Ll.P.

C. vulgaris L.

Down—Downpatrick, and Clandeboye Lakes, R.Ll.P.

Antrim—In Lough Neagh south of Shane's Castle, R.Ll.P.

Derry—Magilligan, Mrs. Leebody; Groves *I.N.*

var. **longibracteata** Kuetz.

Down—Co. Down [Victoria Park], S.A.S.; H. & J. Groves, *Journ. Bot.* 1890. Blackstaff Bridge near Kirkcubbin, R.Ll.P.

Antrim—Springfield, W. M. Hind; Groves *I.N.*

Nitella translucens Ag.

Down—Pool on Conlig Hill, W. D. Donnan. Very abundant in a small lake in Clandeboye demesne, R.Ll.P.

Antrim—Lissanorn Castle, D. Moore; Groves *I.N.*

Derry—Kilrea, D. Moore; Groves *I.N.* (still there, R.Ll.P.). Enagh Lough, Mrs. Leebody. Killelagh Lough above Maghera, R.Ll.P.

N. opaca Ag.

Down—Tollymore Park, Burren River, Lough Island Reavy, and by Bann above Hilltown, S. & P. Money Lake and Ballygowan quarries, R.Ll.P.

Antrim—Ram's Island, H.W.L. Six-mile River at Templepatrick, S.A.S.

Derry—Kilrea, W. Thompson; Groves *I.N.* Racecourse bog near Londonderry, Mrs. Leebody. Killelagh Lough above Maghera, R.Ll.P.

MUSCI.

ANDREAACEÆ.

Andreæa crassinervis Bruch.
Down—Eagle Mountain, C.H.W.; Lett *R.I.A.*

A. rupestris (L.) Roth.
Down—Summit of Slieve Bignian, H.W.L.
var. **falcata** Schimper.
Down—Rocky Mountain near Hilltown, C.H.W.
var. **hamata** Lindb.
Down—Slieve Commedagh and Slieve Dermot, H.W.L.

POLYTRICHACEÆ.

Oligotrichum incurvum (Huds.) Lindb.
Down—Devil's Brewing Pan at Mourne Mountains, Templeton MSS.
Antrim—Gravelly heath above Cave Hill Deerpark, C.H.W.

Polytrichum urnigerum Linn.
Derry—Garvagh, S. A. Brenan; H.W.L.

P. attenuatum Menz.
Down—Drumsallagh, Aghaderg, H.W.L. 1889. Saintfield demesne, C.H.W. & H.W.L.

DICRANACEÆ.

Pleuridium axillare (Dicks.) Lindb.
Down—Abundant in stubble fields, and by the lake shore at Loughbrickland, H.W.L.

P. subulatum (Huds.) Raben.
Down—Warrenpoint, C.H.W. Scarva, H.W.L.
Antrim—Glendun, S. A. Brenan; H.W.L.

Ditrichum homomallum (Hedw.) Hampe.
Antrim—Glenariff, H.W.L.

Anisothecium crispum (Schreb.) Lindb. var. **β. elatum.**
Antrim—Cushendall, H. N. Dixon, *Journ. Bot.* 1891.
Seems to be the only Irish locality for this variety.

A. rubrum (Huds.) Lindb.
Down—Deer's Meadow and Rocky Mountain, Lett *R.I.A.*

A. rufescens (Dicks.) Lindb.
Down—Abundant on shores of Loughbrickland, H.W.L.

A. squarrosum (Starke) Lindb.
Antrim—Slievenanee and Glenballyemon, H.W.L.

Campylopus flexuosus (L.) Brid.
Antrim—Cloughcor near Glenariff, H.W.L.

C. setifolius Wilson.
Down—Pigeon Rock Mountain, Lett *R.I.A.*

Dicranoweissia cirrata (L.) Lindb.
Antrim—On thorn bushes in Cave Hill Deerpark, C.H.W.

Dicranum majus Sm.
Derry—Lignapeiste Glen, Mrs. Leebody.

D. Bonjeani De Not.
Down—Slieve Dermot, Lett *R.I.A.*
Antrim—Parkmore, H.W.L.

D. fuscescens Turner.
Down—Shanlieve, C.H.W.; Lett *R.I.A.*

D. Scottii Turner.
Down—Hen Mountain, Lett *R.I.A.*

Dichodontium pellucidum (L.) Schimp.
Antrim—Cushendall, H. N. Dixon, *Journ. Bot.* 1891.

D. flavescens (Dicks.) Lindb.
Antrim—Ballycastle, H. N. Dixon, *Journ. Bot.* 1891.

TORTULACEÆ.

Pottia Heimii (Hedw.) Fuern.
Antrim—Giant's Causeway, H. N. Dixon, *Journ. Bot.* 1891.
Derry—Between Portstewart and Bann mouth, H.W.L.

P. Starkei (Hedw.) C. Muell.
Antrim—Ditch-bank at Ballysillan limestone quarries, S.A.S.

Tortula crissefolia (Neck.) Lindb.
Down—Old quarry at Maralin, H.W.L.
Antrim—Ditch-bank at Ballysillan limestone quarry, S.A.S.

T. papillosa Wils.
Down—Drumsallagh, Aghaderg, H.W.L.

T. princeps De Not.
Antrim—Glenarm Deerpark, D.M.; *Brit. Moss Flora.*
Derry—Benevenagh, S.A.S.; *Brit. Moss Flora.*

Mollia microstoma Lindb.
Down—Near Warrenpoint, C.H.W.; Lett *R.I.A.*
Antrim—Ballycastle, H. N. Dixon, *Journ. Bot.* 1891.

M. aruginosa (Sm.) Lindb.
Antrim—Parkmore and Glenballyemon, H.W.L. Drumnasole, S. A. Brenan; H.W.L.

M. verticillata (L.) Lindb.
Down—Wall of bridge in Tollymore Park, C.H.W.; H.W.L.
Antrim—Glenarm, H. N. Dixon, *Journ. Bot.* 1891.

M. crispula (Bruch) Lindb.
Antrim—Ballycastle, in fruit, H. N. Dixon, *Journ. Bot.* 1891.

M. literalis (Mitt.) Braith.
Antrim—Cushendall and Ballycastle, H. N. Dixon, *Journ. Bot.* 1891.

M. brachydontia Lindb.
Down—Kinahalla, H.W.L.

M. tenuirostris (Hook. & Tayl.).
Down—Several stations in Mourne Mountains, H.W.L.

M. inclinata (Hed.) Lindb.
Antrim—Portrush, H.W.L.
Derry—Portstewart, H.W.L.

M. tortuosa (L.) Schrank.
Antrim—Drumnasole, S. A. Brenan; H.W.L.

Barbula curvirostris (Ehr.) Lindb.
Down—Cove Mountain, Lett *R.I.A.*

B. spadicea Mill.
Down—Tollymore Park, Lett *R.I.A.*

B. rigidula (Hed.) Mitt.
Antrim—Fairhead, H.W.L.

B. cylindrica (Tayl.) Schimp.
Antrim—Glenballyemon, H.W.L. Cushendall, H. N. Dixon, *Journ. Bot.* 1891.

B. unguiculata (Huds.) var. γ. **apiculata** Hedw.
Down—Wall of Aghaderg Glebe, H.W.L.

Leersia contorta (Wulf.) Lindb.
Antrim—Rocks at upper end of Colin Glen, J. H. Davies. Glenballyemon, H.W.L. Glendun, S. A. Brenan; H.W.L.

WEBERACEÆ.

Webera sessilis (Schmid.) Lindb.
Antrim—Slemish Mountain, H.W.L.
Stated in *Flora* to be barren. This was an error, as Mr. Lett finds it fruiting freely from early summer till late in autumn.

GRIMMIACEÆ.

Grimmia funalis (Schwaeg.).
Down—Slieve Dermot, Lett *R.I.A.*

G. orbicularis Bruch.
Down—Top of stone fence on Spelga Mountain, H.W.L.; *Brit. Moss Flora.*
This is the only locality in the North of Ireland known to us.

G. trichophylla Grev.

Down—Fofanny, and Butter Mountain, Lett *R.I.A.* Bryansford, C.H.W., *Brit. Moss Flora.*

Antrim—Basalt rocks at summit of Ballygally Head, S.A.S.

G. Hartmani Schimp.

Antrim—Fairhead, H. N. Dixon, *Journ. Bot.* 1891.

G. Donii Sm.

Down—Granite blocks between Slieve Martin and Kilbroney bog, Lett *R.I.A.*

G. ovata was hastily inserted as an addendum when the *Flora* was at Press. This must be deleted, as it was subsequently ascertained to be an erroneous determination.

G. obtusa (Sm.) Lindb.

Down—Shanalieve, Slieve Donard and Slieve Bingian, Lett; *Brit. Moss Flora.*

G. affinis (Schleich.) Lindb. var. β. **gracilescens** Lindb.

Down—Shanslieve, Lett; *Brit. Moss Flora.*

G. patens (Dicks.) Br. et Schimp.

Antrim—The Craig rocks, Rasharkin, H.W.L.

By inadvertance 2700 was printed in *Flora* for 1200 feet, the highest elevation known to us.

ORTHOTRICACEÆ.

Orthotrichum Sturmii. The Lough Neagh locality of *Flora* must be transferred to *O. striatum.*

Orthotrichum diaphanum Schrad.

Down—Donard demesne and Loughbrickland, H.W.L.

O. cupulatum Hoffm.

Antrim—Glenarm, H. N. Dixon, *Journ. Bot.* 1891.

O. stramineum Hornsch.

Antrim—Fairhead, D.M.; herb. Carrington, *fide* G. A. Holt.

O. rivulare Sm.

Antrim—Ram's Island, J. H. Davies.

O. pulchellum Sm.
Down—On apple trees at Ravernet, J. H. Davies.
Antrim—Parkmore, H.W.L.

Weissia Bruchii (Hornsch.) Lindb.
Antrim—Glenariff, S.A.S. Glendun, S. A. Brenan; H.W.L.

W. vittata (Mitt.) Braith.
Antrim—Glenshesk, 1880, and Glenariff, 1889, S.A.S.; *Brit. Moss Flora.*

SPLACHNACEÆ.

Tetraplodon bryoides (Mitt.) Braith.
Antrim—Glenariff, S. A. Brenan.

FUNARIACEÆ.

Funaria obtusa (Dicks.) Lindb.
Antrim—Sallagh Braes, C.H.W.

F. attenuata (Dicks.) Lindb.
Down—Wet rocks near Donaghadee, J. H. Davies.
Antrim—Islandmagee, J. H. Davies.
Derry—Benbradagh Mountain, Mrs. Leebody.
It is to be regretted that the name of Templeton, our pioneer botanist, which was associated with this plant by Smith in 1813, has to be replaced by a prior term.

F. calcarea Wahlenb.
Antrim—Near Carrick-a-rede, H. N. Dixon, *Journ. Bot.* 1891.

BRYACEÆ.

Leptobryum pyriforme (L.) Wils.
Down—Abundant on flower-pots at Aghaderg, H.W.L.

Pohlia acuminata Hornsch.
Down—Wet rocks at Blackstairs, Slieve Donard, and on Spaltha Mountain, Lett *R.I.A.*

P. nutans (Schreb.) Lindb. var. **longiseta** Brid.
Down—County Down [Cotton Moss], S.A.S.; *Brit. Moss Flora.*

P. annotina (L.) Lindb.
Down—Shanlieve, S.A.S. Slieve Bingian, Lett *R.I.A.*

P. albicans (Wahl.) Lindb.
Down—Wayside well near Fofanny, Lett *R.I.A.*

Plagiobryum Zierii (Dicks.) Lindb.
Antrim—Sallagh Braes, C.H.W.

Bryum inclinatum (Swartz) Bland.
The station in Victoria Park assigned to this species was an error, the plant having subsequently been decided to be *B. intermedium.*

Bryum Mildei Juratz.
Antrim—Slemish Mountain, Moore; *Brit. Moss Flora.*

B. alpinum Huds.
Down—White River Glen, Lett *R.I.A.* Fruiting very sparingly in Mourne Mountains, S.A.S., July, 1888.
Antrim—Rasharkin bog, H.W.L. & C.H.W.

B. pallens Swartz.
Down—Slieve Donard, Lett *R.I.A.*
Antrim—Parkmore, H.W.L.

B. ventricosum Dicks.
Down—Leitrim near Hilltown, and frequent in the Mourne Mountains, Lett *R.I.A.*
Antrim—Near Parkmore, H.W.L. By the stream in Glensheak, in fine fruit, J. H. Davies.
Derry—Lignapeiste Glen, Mrs Leebody.

B. proliferum (L.) Sibth. (*B. roseum* Dill.).
Down—Newcastle, C.H.W.

BARTRAMIACEÆ.

Bartramia pomiformis (L.) Hedw.
Antrim—Drumnasole, S. A. Brenan; H.W.L.

B. norvegica (Gunn.) Lindb.
Antrim—Fruiting in Glenariff, H.W.L.

B. fontana (L.) Swartz var. β. **falcata** Brid.
Antrim—Rasharkin, H.W.L. & C.H.W.

MNIACEÆ.

Gymnocybe palustris (L.) Fries.
Antrim—Glendun, S. A. Brenan; H.W.L.
Aulacomnium and *Sphærocephalus* must give way to the prior name of Fries.

Mnium riparium Mitt.
Antrim—A few barren stems intermixed with other mosses in wet bog at Glenariff, H.W.L.
The only Irish locality known at present.

M. cuspidatum (L.) Neck.
Antrim—Wet ditch at Hightown, Carnmoney, C.H.W.

M. pseudopunctatum Bruch & Schimp.
Antrim—Parkmore, H.W.L.

HYPNACEÆ.

Leskea polycarpa Ehr.
Down—Loughbrickland, H.W.L.

Anomodon viticulosus (L.) Hook. & Tayl.
Antrim—Fruiting at Drumnasole, S. A. Brenan; H.W.L.

Hypnum filicinum Linn.
Antrim—Glendun, S. A. Brenan; H.W.L.

H. confervoides Bridel.
Derry—Sandy warren at Portstewart, S.A.S., 1884.
The only Irish station.

H. irriguum Wils.
Down—Rocky stream in Drumbo Glen, S.A.S.
Doubtfully mentioned in excluded list of *Flora*.

H. riparium Linn.
Down—Shore of Loughbrickland, H.W.L.
Antrim—By the Lagan near Glenmore, J. H. Davies. Pond by railway line north of Kilroot, S.A.S. Parkmore, H.W.L.

H. stellatum Schreber.
Down—Stormount Glen, and marsh on Conlig Hill, S.A.S.

Antrim—Glendun, S. A. Brenan; H.W.L. Abundant in Rasharkin bog, H.W.L.

H. fuitans Linn.

Antrim—Parkmore and Lurgethan, H.W.L. Glendun, S. A. Brenan; H.W.L.

H. Knaffii Br. & Schimp.

Down—Near shore of Lough Neagh at Kilmore, C.H.W. Loughbrickland, H.W.L.

H. revolvens Swartz.

Down—Slieve Dermot, Lett *R.I.A.*

Antrim—Glenballyemon, H.W.L.

Derry—Marshes in Portstewart sandhills, S.A.S.

H. scorpioides Linn.

Down—Margin of Ballyward Lake and of Pollramer Lake, and in fruit in a marsh on Conlig Hill, S.A.S.

Antrim—Glenariff and Glendun, H.W.L.

H. ochraceum Turner.

Antrim—Glenariff, H.W.L.

H. sarmentosum Wahl.

Down—Shanslieve, Lett *R.I.A.*

H. Swartzii Turner.

Antrim—Glendun, S. A. Brenan; H.W.L.

H. speciosum Brid.

Antrim—Knockagh, C.H.W.

H. crassinervum Tayl.

Antrim—Knockagh, and on wall at Carnmoney, and on limestone blocks in Cave Hill Deerpark, C.H.W. Glenariff, H.W.L.

H. piliferum Schreb.

Down—Tollymore Park, C.H.W.

Antrim—Glendun, S. A. Brenan; H.W.L.

H. tenellum Dicks.

Down—Greenhouse at Aghaderg Glebe, H.W.L. Wall of bridge in Tollymore Park, Lett *R.I.A.*

Antrim—Walls about Coole Glebe, Carnmoney, C.H.W. Parkmore, H.W.L. Drumnasole, S. A. Brenan; H.W.L.

H. flagellare Dicks.

Down—Rocks by the river at Tollymore Park, Templeton (spec. in herb. Belf. Mus.). Slieve Donard, Slieve Commedagh, and frequent in the Mourne range, but always barren, S.A.S., *Suppl. to Mosses of N.E. Ireland*. Tollymore, Yellow Water, &c., frequent, C.H.W. Common throughout the Mourne range, Lett *R.I.A.*

Antrim—Glenariff, H.W.L.

Localities for this species were published in *Supplement to Mosses of North-East Ireland*, but accidentally omitted from *Flora*.

H. heteropterum (Bruch).

Down—Slieve Bingian and Slieve Meel Beg, Lett *R.I.A.* Rostrevor Mountain, C.H.W.

Antrim—Slemish Mountain, H.W.L. & C.H.W.

In following Moore and giving *H. atrovirens* Turner as a synonym for "*H. heteropteron*," the authors of the *Flora* were in error, as Mr. Lett has pointed out to us. Moore's second synonym, *H. catenulatum*, is likewise erroneous.

H. cupressiforme Linn. var. **lacunosum** Wils.

Down—Slievenabrock, Lett *R.I.A.*

H. resupinatum Wils.

Down—Slieve Donard, H.W.L.

H. Patientiæ Lindb.

Down—Saintfield, C.H.W.

Antrim—Glendun, S. A. Brenan; H.W.L. Carnmoney and Hydepark, widely distributed, C.H.W.

H. Sendtneri Spruce.

Down—Saintfield, C.H.W. Sandy bank at Knocknagoney, S.A.S.

Antrim—Slemish and Sallagh Braes, C.H.W.

H. pulchellum Dicks.

Down—Tollymore Park, C.H.W.

Antrim—Glenariff, C.H.W. & H.W.L.

H. undulatum Linn.

Antrim—Parkmore, H.W.L.

Derry—Benbradagh Mountain, Mrs. Leebody.

H. sylvaticum Linn.
Down—Slieve Donard, Lett *R.I.A.*

H. denticulatum Linn.
Down—Chimney Rock Mountain, Lett *R.I.A.* In a small glen close to Dundonald station, S.A.S.

SPHAGNACEÆ.

Sphagnum Austini Sulliv.
Antrim—Evish Mountain near Parkmore, H.W.L., 1889.
Mr. Lett, who was the first to find this plant in Ireland, has subsequently (1892) met with it in King's County.

S. papillosum Lindb.
Down—Common in Mourne Mountains, Lett *R.I.A.*
Antrim—Parkmore, H.W.L. Glendun, S. A. Brenan; H.W.L.

S. tenellum Ehr.
Antrim—Glendun, S. A. Brenan; H.W.L.

S. subsecundum Nees & Von Es.
Antrim—Crockalough near Parkmore, H.W.L.
var. obesum Wilson.
Derry—Racecourse bog at Ballyarnot, Mrs. Leebody.

S. rigidum Nees & Von Es. var. β. **compactum** DC.
Antrim—Parkmore, Crockalough, and Rasharkin bog, H.W.L. Glendun, S. A. Brenan; H.W.L.

S. teres Angst.
Down—Hen Mountain, Lett *R.I.A.*
The only Irish station known at present.

S. acutifolium Ehr.
Antrim—Glendun, S. A. Brenan; H.W.L.
A number of varieties of this polymorphic species occur.

S. intermedium Hoffm.
Antrim—Parkmore, H.W.L.

S. cuspidatum Ehr.
Down—Rostrevor Mountain, C.H.W.; Lett *R.I.A.*
Antrim—Parkmore and Glenballyemon, H.W.L.
var. **plumosum** Nees & Hsch.
Antrim—Glendun, S. A. Brenan; H.W.L.

HEPATICÆ.

JUNGERMANNIACEÆ.

Frullania fragilifolia Tayl.
Antrim—"The Craigs," Rasharkin, H.W.L. & C.H.W. Glenariff, H.W.L.

Lejeunea hamatifolia Hook.
Antrim—Glenariff, C.H.W.

L. calcarea Libert.
Antrim—Glenariff, H.W.L. and C.H.W.

L. ovata (Dicks.) Tayl.
Antrim—Glenariff, C.H.W.

L. microscopica Tayl.
Antrim—Glenariff, C.H.W.

L. patens Lindb.
Antrim—On *Neckera crispa* at Sallagh Braes, H.W.L

L. Mackaii (Hook.) Spreng.
Down—On an old yew tree in Tollymore Park, C.H.W.; Lett *R.I.A.*
Antrim—Limestone rocks in Redhall Glen, 1809, Templeton. Gobbin cliffs, C.H.W. Glenariff, H.W.L.

Porella rivularis Nees.
Down—Saintfield, C.H.W.

Pleuroxia purpurea (Lightf.) Dum.
Antrim—Rasharkin bog, H.W.L. & C.H.W. Evish Mountain, H.W.L.

Trichocolea tomentella (Ehr.).
Down—By a rivulet in Belvoir Park, Templeton.
Antrim—Glendun, S. A. Brenan; H.W.L.

Lepidozia setacea (Web.) Dum.
Down—Hen Mountain, Lett *R.I.A.* Tollymore Park, H.W.L.
Antrim—Glendun, S. A. Brenan; H.W.L. Rasharkin bog, H.W.L.

Bazzania trilobata (L.) Gray.
Down—Tollymore Park, Templeton.

Odontoschisma sphagni (Dicks.).
Down—Tollymore Park and Cock Mountain, C.H.W.; Lett *R.I.A.*
Antrim—Cloughcor near Parkmore, H.W.L.

Cephalozia divaricata (Sm.).
Down—Hen Mountain and bog between Hilltown and Rathfriland, Lett *R.I.A.* Tollymore Park, C.H.W.
Antrim—Parkmore, H.W.L.
This was probably the plant noted by Templeton as *C. byssacea*, occurring at Lambeg, Cranmore, etc.

C. connivens (Dicks.) Spruce.
Down—Slievenamady, Lett *R.I.A.*

Kantia trichomanis (Linn.).
Down—Bog near Ballynahinch, H.W.L.
Antrim—Glendun, S. A. Brenan; H.W.L. Parkmore and Lurgethan, H.W.L.

Scapania nemorosa (L.) Dum.
Down—Saintfield, frequent, C.H.W.
Antrim—Glendun, S. A. Brenan; H.W.L. Lurgethan, H.W.L.

S. resupinata (L.) Dum.
Antrim—Fairhead and Glendun, in company with Taylor, Hooker, and Stokes, Templeton.

S. umbrosa (Schrad.) Dum.
Down—Hen Mountain, H.W.L.

S. curta (Mart.) Dum.
Down—Ballyvarley bog, Aghaderg, H.W.L.

Chiloscyphus polyanthos (L.) Corda.
Down—Aghaderg Glebe and Ballyvarley bog, H.W.L.
Antrim—Slemish, Templeton. Glendun, S. A. Brenan; H.W.L.

Leptoscyphus interruptus Nees var. β. **pyrenaicum** Spruce.
Down—Roadside wall south of Rostrevor quay, H.W.L.

Plagiochila spinulosa (Dicks.) Dum.
Antrim—Gobbin cliffs, C.H.W. Drumnasole and Rasharkin bog, H.W.L.

P. tridenticulata (Tayl.).
Antrim—Drumnasole, S. A. Brenan; H.W.L.

Jungermannia riparia Tayl.
Down—Cove Mountain, Lett *R.I.A.*
Antrim—Colin Glen, C.H.W. Drumnasole and Glendun, S. A. Brenan; H.W.L. Glenariff and Rasharkin bog, H.W.L.

J. crenulata Sm. var. **gracillima** Sm.
Down—Tollymore Park and Slieve Commedagh, Lett *R.I.A.* Aghaderg, H.W.L.

J. pumila With.
Antrim—Glendun, S. A. Brenan; H.W.L. Slievenanee, H.W.L.

J. sphaerocarpa Hook.
Antrim—Colin Glen, 1818, Templeton. Parkmore, H.W.L.

J. barbata Schreb. (Coll.).
Antrim—Rasharkin bog and Slemish Mountain, H.W.L.
Given by Mr. Lett as *J. barbata* var. *quinquedentata*, but Schreber's species seems inseparable from *quinquedentata* Hudson.

Nardia sphacelata Gieseke.
Down—Slieve Donard, J. J. Andrew; H.W.L.

N. hyalina (Lyall) Carring.
Down—Cove Mountain and Hen Mountain, H.W.L.
Antrim—Parkmore, H.W.L.

Cesia crenulata (Gottsche) Carring.
Antrim—Shady rocks on north-east side of Slemish, H.W.L. & C.H.W.

Pellia calycina (Tayl.).
Down—Aghaderg, H.W.L.
Antrim—Drumnasole, S. A. Brenan; H.W.L. Parkmore, H.W.L.

Aneura pinguis (L.) Dum.
Derry—Portstewart, S.A.S.

A. multifida (Dill.) Gray.
Down—Loughbrickland, H.W.L.
Antrim—Seymour Hill, Templeton.

MARCHANTIACEÆ.

Preissia commutata Nees.
Down—Scarva demesne, H.W.L.
Antrim—Parkmore, H.W.L. Glendun, S. A. Brenan; H.W.L.

Lunularia cruciata (Linn.) Dum.
Down—Drumero, C.H.W. Aghaderg, H.W.L.
Antrim—Moss hole at Seymour Hill, Templeton, 1806. East end of Belfast Botanic Gardens, H.W.L.

RICCIACEÆ.

Riccia fluitans Linn.
Down—Abundant in a drain at Meenan bog, Loughbrickland, H.W.L.

ANTHOCEROTACEÆ.

Anthoceros punctatus Linn.
Down—Clover and stubble fields in Parish of Aghaderg, H.W.L.
Antrim—Belfast Botanic Gardens and river bank in Glendun, H.W.L.

ERRONEOUS OR DOUBTFUL HEPATICS.

The following hepatics, quoted from the Templeton MSS., have been deemed too doubtful for insertion in the foregoing list. While the greater part are certainly errors, it is probable that some may yet be verified, and with this view they are now made public :—

Porella thuja. On the rock at the waterfall in Woodburn Glen, 31st March, 1807.

Cephalozia curvifolia. Rock crevices on Bingian Mountain.

C. byssacea. Lambeg, Cranmore, and Birky moss.

Harpanthus scutatus. Glen below Rockport.

Plagiochila tridenticulata. Common on the rocks of the Cave Hill.

Mylia anomala. Annahilt bog and summit of Divis. [Perhaps the same plant as his *M. Taylori.*]

Jungermannia cuneifolia. Near top of Divis.

J. pumila. Common on bare ground about Belfast.

J. barbata. Common in the recumbent state on the rocks about the Cave Hill; also on Divis Mountain, and in Ness Glen.

J. exsecta. With the next species on Holywood Warren.

J. excisa. Divis and Black Mountain, and on Holywood Warren.

J. incisa. Lambeg. Moor halfway between Holywood and Bangor, and rocky bank above the Manyburn at Purdysburn racecourse.

Nardia compressa. Near Belfast.

In the foregoing list Templeton's nomenclature, which was that current in his time, has been replaced by names now adopted.

ADDENDA ET CORRIGENDA.

p. 185. Add *Grimmia ovata* to the list of plants to be withdrawn from *Flora*.

p. 189. *Sparganium neglectum* was recorded prematurely; on referring the specimen to the describer of that form, it was named by him *S. ramosum* var. *microcarpum*, and is recorded under that name in the body of the Supplement, p. 201.

pp. 142-8. A number of specimens of cryptogams have been examined and verified since the first portion of the manuscript went to press, and the following have to be placed to lists of additions in the Introduction.

DISTRICT 12.

Hypnum confervoides. *Bryum Mildei.*
H. flagellare.

COUNTY DOWN.

Hypnum flagellare.

COUNTY ANTRIM.

Tortula princeps. *Bartramia norvegica.*
Hypnum flagellare.

COUNTY DERRY.

Hypnum confervoides. *Funaria attenuata.*
H. revolvens. *Anoura pinguis.*

A BIBLIOGRAPHY OF IRISH GLACIAL AND POST-GLACIAL GEOLOGY.

BY

R. LLOYD PRAEGER, B.E.

BEING AN APPENDIX (No. 6 OF VOL. 2) TO THE PROCEEDINGS OF THE

BELFAST NATURALISTS' FIELD CLUB

FOR 1895-96.

A BIBLIOGRAPHY

OF

IRISH GLACIAL AND POST-GLACIAL GEOLOGY.

THE following list of books, papers, and notes bearing on the glacial and post-glacial geology of Ireland had but a small beginning. It originated in a few dozen references to records of post-glacial fossils in the North-east of Ireland, thrown together for my own convenience. This list was added to by degrees, accumulating according to the manner of a snowball, each paper giving references to a number of others. Eventually, it appeared to me that if the list could be extended, completed, and published, it might prove a saving of time and labour to other workers; and in this thought I had especially in my mind the energetic members of the Geological Section of the Belfast Naturalists' Field Club, who have not convenient access to many of the journals, &c., quoted below, and on whom Prof. Cole recently urged[1] the importance of getting together their local geological literature.

In order to complete the list, systematic work was necessary, and sets of Periodicals and Proceedings of Societies which might contain references to Irish geology had to be carefully gone through. This portion of the work proved more extensive and tedious than was expected, and indeed had I known how much time it would involve, it is doubtful if the present effort would have seen the light. But in spite of time and care, I am well aware that my list must contain many omissions, though it is hoped that none of them are serious ones. Geologists working at any branch of the subjects included in the present compilation, or at the geology of any particular district, are nearly sure, among the scattered records of Irish geology, to unearth some references which, in my necessarily hurried work, have escaped notice. To them I would appeal to favour me with a note of such references, in order that, by the publication of a supplement, the present attempt may justify its title, and become a complete guide to the literature of Irish glacial and post-glacial geology.

As to the scope of the present list. Although believed to be of Pliocene, not Pleistocene age, the so-called "manure gravels" of Wexford have been included. They are the only marine Tertiary beds in Ireland, and are moreover of late Pliocene age, possessing a fauna distinctly related to that of the incoming glacial period; when to these is added the fact that the literature relating to the Wexford beds is much mixed up with that of the succeeding series, the advantage and convenience of this inclusion will be apparent. In view of recent papers in the *Irish Naturalist* on caves, and Dr. Scharff's bibliography of that subject, references to caves have been included, even if these references had no distinctly geological bearing; for much cave-exploration remains to be carried out in Ireland, as to both their past and present fauna; and a list of localities is therefore a desideratum.

In dealing with the human period, a difficulty constantly presented itself as to

[1] *Irish Naturalist*, IV., 49. 1895.

how far papers on the remains of pre-historic man were admissible in a geological bibliography. Thus, while a flint implement found in the stratified marine gravels of Antrim, or a bronze celt in a stalagmitic deposit, are objects of distinct geological interest, the same cannot be said of a cinerary urn found in a kist, or a flint arrow-head which the urn may have contained. But it is difficult to draw the line, for geology and archæology not only meet, but overlap. The rule which I have endeavoured to follow is to admit papers which describe the *mode of occurrence* or *stratigraphical position* of human relics, and to omit papers dealing with objects artificially buried, or merely with the affinities or ornament of objects found. Thus sand-hill sites, crannogs, cave-deposits, and flint implement gravels are included; but papers on such subjects shade imperceptably into others which are purely ethnographical in their bearing.

In the way of existing bibliographies there was very little to assist me. The only papers giving even a tolerably complete bibliography of any part of the subjects included in the present paper, or of any district, were Dr. V. Ball's list of papers on Irish fossil mammals (**39**)* and Mr. Hardman's list of papers on North of Ireland geology (**251**). The shorter lists of papers given by Adams (**5, 6**), Close (**129**), Cole (**136**), Gray (**232**), Hull (**297**), M'Henry (**492**), and Scharff (**607**), were of course consulted. I made a point of verifying every reference by consultation of the original publication, where possible; the few papers (4 out of the 767 which have a place in the list) which I was not able to consult are distinguished by an asterisk.

Subjoined are particulars relating to Proceedings of Societies and to Journals systematically examined for references to the subject included in the list, the contracted titles used in the list being added in parenthesis:—

ACADEMIES' PROCEEDINGS, &c.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE:

Reports, years 1-64, 1831-1894. (*Brit. Assoc. Reports.*)

GEOLOGICAL SOCIETY OF LONDON:

Quarterly Journal, I.—LI., 1845-1895. (*Q.J.G.S.*)

GEOLOGISTS' ASSOCIATION, LONDON:

Proceedings, I.—XIV. pt. 5, 1859-1895. (*Proc. Geol. Assoc.*)

ANTHROPOLOGICAL INSTITUTE:

Journal, I.—XXV. pt. 2, 1871-1895. (*Journ. Anthrop. Inst.*)

GEOLOGICAL SURVEY OF IRELAND:

Memoirs, 120 parts, 1858-1891. 8vo.

ROYAL IRISH ACADEMY:

Proceedings, I.—X., 1836-1870; 2nd s. (*Science*), I.—IV., 1869-1888; 2nd s. (*Polite Literature and Antiquities*), I.—II., 1870-1888; 3rd s., I.—III. pt. 4, 1887-1895. 8vo. (*Proc. R.I.A.*)

Transactions, I.—XXX. pt. 17, 1785-1895. 4to. (*Trans. R.I.A.*)

ROYAL DUBLIN SOCIETY:

Journal, I.—VII., 1856-1878. 8vo. (*Journ. R.D.S.*)

Scientific Proceedings, n.s., I.—VIII. pt. 4, 1878-1895. 8vo. (*Sci. Proc. R.D.S.*)

* The numbers refer to the index numbers in the general list.

Scientific Transactions, 2nd s., I.—V. pt. 11, 1877-1895. 4to. (*Sci. Trans. R.D.S.*)

GEOLOGICAL SOCIETY OF DUBLIN:

Journal, I.—X., 1833-1864. (*Journ. G.S.D.*)

ROYAL GEOLOGICAL SOCIETY OF IRELAND (previously Geological Society of Dublin):

Journal, I.—VIII. (XI.—XVIII. of whole series), 1864-1889. (*Journ. R.G.S.I.*)

DUBLIN NATURAL HISTORY SOCIETY:

Proceedings, I.—VI., 1849-1870. (*Proc. Dublin Nat. Hist. Soc.*)

BELFAST NATURALISTS' FIELD CLUB:

Reports, 1—10, 1863-4—1872-3. (*Ann. Reports B.N.F.C.*)

Annual Reports and Proceedings, 2nd s., I.—IV. pt. 2, 1873-4—1894-5. (*Proc. B.N.F.C.*)

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY:

Proceedings, 11 vols., 1871-2—1881-2.

Reports and Proceedings, 13 vols., 1882-3—1894-5. (*Proc. B.N.H. & P.S.*)

CORK HISTORICAL AND ARCHÆOLOGICAL SOCIETY:

Journal, I.—III., 1892-1894; and n.s.I., 1895. (*Journ. Cork Hist. & Arch. Soc.*)

KILKENNY ARCHÆOLOGICAL SOCIETY:

Transactions, I.—II., 1849-1853. (*Trans. Kilk. Arch. Soc.*)

Proceedings and Transactions, III., 1854-1855. (*Proc. and Trans. Kilk. Arch. Soc.*)

KILKENNY AND SOUTH-EAST OF IRELAND ARCHÆOLOGICAL SOCIETY:

(Previously Kilkenny Archæological Society.)

Journal, n.s., I.—VI., 1856-1867. *Journ. Kilk. & S.E. Ireland Arch. Soc.*)

HISTORICAL AND ARCHÆOLOGICAL ASSOCIATION OF IRELAND:

(Previously Kilkenny & S.E. Ireland Arch. Soc.)

Journal, 3rd s., I., 1868-1869. (*Journ. H. & A.A.I.*)

ROYAL HISTORICAL AND ARCHÆOLOGICAL ASSOCIATION OF IRELAND:

(Previously Hist. & Arch. Assoc. of Ireland.)

Journal, 4th s., I.—IX., 1870-1889. (*Journ. R.H. & A.A.I.*)

ROYAL SOCIETY OF ANTIQUARIES OF IRELAND:

(Previously R. Hist. & Arch. Assoc. of Ireland.)

Proceedings and Papers, 5th s., I., 1890-1891. (*Proc. and Papers R.S.A.I.*)

Journal, 5th s., II.—V., 1892-1895. (*Journ. R.S.A.I.*)

JOURNALS, &c.

Geological Magazine:

Decade 1, vol. I. to decade 4, vol. II., 1864-1895. (*Geol. Mag.*)

Geologist, The :
From 1858 to 1864.

Glacialists' Magazine :
I.—III. pt. 3, 1893-1895.

Geological Record :
From 1874 to 1884.

Annals of British Geology :
From 1890 to 1894.

Natural History Review :
I.—VII., 1854-1860; and n.s., I.—V., 1861-1865. (*Nat. Hist. Review.*)

Dublin Quarterly Journal of Science:
I.—VI., 1861-1866. (*Dublin Q.J.S.*)

Dublin Philosophical Journal and Scientific Review :
I.—II., 1825-1826. (*Dublin Phil. Journ. & Scient. Review.*)

Irish Naturalist :
I.—IV., 1892-1895. (*I.N.*)

Ulster Journal of Archæology :
I.—IX., 1853-1862.
New Issue, I., 1894-95. (*Ulst. Journ. Arch.*)

About a hundred books on geology, archæology, topography, &c., which contained, or might have contained, references to the subjects in hand, were likewise looked through.

Occasional references were also made to the following :—

ACADEMIES' PROCEEDINGS, &c :—

ROYAL SOCIETY OF LONDON :
Philosophical Transactions. (*Phil. Trans.*)

GEOLOGICAL SURVEY OF GREAT BRITAIN :
Memoirs.

PALÆONTOGRAPHICAL SOCIETY :
(*Publications.*)

GEOLOGICAL SOCIETY OF LONDON :
Proceedings. (*Proc. Geol. Soc. London.*)

ZOOLOGICAL SOCIETY OF LONDON :
Proceedings. (*Proc. Zool. Soc. London.*)

SOCIETY OF ANTIQUARIES OF LONDON :
Proceedings. (*Proc. Soc. Ant. London.*)

MANCHESTER GEOLOGICAL SOCIETY :
Proceedings. (*Proc. Manchester Geol. Soc.*)

LITERARY AND PHILOSOPHICAL SOCIETY OF MANCHESTER:
Proceedings. (*Proc. Lit. & Phil. Soc. Manchester.*)

LIVERPOOL GEOLOGICAL SOCIETY:
Proceedings. (*Proc. L'pool Geol. Soc.*)

GEOLOGICAL AND POLYTECHNIC SOCIETY OF THE WEST RIDING OF YORKSHIRE:
Proceedings. (*Proc. Geol. & Polytechnic Soc. of W. Riding of Yorks.*)

SOCIETY OF ANTIQUARIES OF SCOTLAND:
Proceedings. (*Proc. Soc. Ant. Scotland.*)

EDINBURGH GEOLOGICAL SOCIETY:
Transactions. (*Trans. Edinb. Geol. Soc.*)

ROYAL PHYSICAL SOCIETY OF EDINBURGH:
Proceedings. (*Proc. R. Phys. Soc. Edinb.*)

GEOLOGICAL SOCIETY OF GLASGOW:
Proceedings. (*Proc. Geol. Soc. Glasgow.*)

NATURAL HISTORY SOCIETY OF GLASGOW:
Proceedings. (*Proc. Nat. Hist. Soc. Glasgow.*)

ROYAL DUBLIN SOCIETY:
*Proceedings.** (*Proc. R.D.S.*)

WATERFORD AND SOUTH-EAST OF IRELAND ARCHÆOLOGICAL SOCIETY:
Journal. (*Journ. Waterford & S.E. Ireland Arch. Soc.*)

MUSÉUM D'HISTOIRE NATURELLE (Paris):
Annales.

SOCIÉTÉ DE SPÉLÉOLOGIE (Paris):
Spelunca: *Bulletin.*

JOURNALS, &c.—
Academy.
Annales des Sciences Naturelles.
Annals and Magazine of Natural History. (*Ann. & Mag. Nat. Hist.*)
Annals of Philosophy.
Archæologia.
Archæological Journal.
Dublin Evening Telegraph.
Dublin Penny Journal.
Edinburgh Journal of Science.
Edinburgh New Philosophical Magazine. (*Edinb. New Phil. Mag.*)
Farmers' Gazette.
Irish Penny Magazine.
Magazine of Natural History (*Mag. of Nat. Hist.*)

* Not to be confounded with the *Scientific Proceedings* issued by this Society.

Natural Science.
Nature.
Philosophical Magazine. (*Phil. Mag.*)
Popular Science Review.
Science Gossip.
Zoologist. (*Zool.*)

It only remains to add a few particulars concerning the list which follows.

Brackets are used to show all editorial additions—the subject of papers which have no printed title, the names of authors of papers published anonymously, and all editorial comments, &c.

When the title of a paper does not sufficiently express its scope, a brief note of its contents is added.

A book or paper is not included in the list if it merely quotes from another without any original expression of opinion—such, for instance, are the references to Irish glacial geology in certain general text-books of geology.

Announcements of exhibits or donations, accounts of excursions, or other officially supplied items in the Proceedings of Societies, are entered under the name of the Society publishing them.

When the date of the reading of a paper before a Society differs from its date of publication, the former is usually given in brackets in addition to the latter. The Volumes of Proceedings of Societies are usually published in parts, and the publication of a volume frequently extends over several years. In bound volumes there is frequently no means of discovering the date of publication of any particular paper, owing to the destruction of the covers or temporary title-pages of the parts. In such cases the date given without brackets is the date on the title-page of the volume; the *collective* date of the volume being usually added in brackets immediately after the number of the volume.

In addition to the contracted titles already given, the following contractions are used :—descr.=description; ref.=reference; locs.=localities; glac.=glacial; post-glac.=post-glacial; geol.=geology.

The list includes papers published up till the end of the year 1895.

LIST OF PAPERS, &c.

1 **A. (M.).**
Islands of Oyster Shells. *Journ. Cork Hist. & Arch. Soc.*, II., 39. 1893. [Near Fota, Co. Cork.]

2 **Adams (A. Leith).**
Report on the Exploration of the Shandon Cave. *Trans. R.I.A.*, XXVI., 187—230, plate 3. 1876. [Full descr. of deposits and animal remains.]

3 —
Observations on the Remains of Mammals found in a Fossil State in Ireland. *Journ. R.G.S.I.*, IV., 246—248. 1877.

4 —
Monograph of the British Fossil Elephants. *Palæontographical Soc.*, 1877-81. [Irish localities.]

5 —
On the Recent and Extinct Irish Mammals. *Sci. Proc. R.D.S.*, n.s. II., 45—86, plates 1—5. (read 1878). 1880.

6 —
Report on the History of Irish Fossil Mammals. *Proc. R.I.A.*, (2) III. (*Science*), 89—100. 1878. ["Abridgement of the Report."]

— See **Ussher (678, 679, 680).**

7 **Adams (A. Leith) S. Haughton, W. Boyd Dawkins,** and **John Evans.**
First Report of the Committee appointed for the Purpose of exploring the Caves of the South of Ireland. *Brit. Assoc. Report for* 1880, 209—211. 1880. [Consists of a report from R. J. Ussher and a letter from R. Day on Carrigower.]

8 — — — — —
Second Report do. do. do. *Brit. Assoc. Report for* 1881, 218–221. 1882. [Report from R. J. Ussher.]

9 **Adams (A. Leith), G. H. Kinahan,** and **R. J. Ussher.**
Explorations in the Bone Cave of Ballynamintra, near Cappagh, County Waterford. *Sci. Trans. R.D.S.*, n.s. I., 177—266, plates 11—14. 1881. [Full descr. of deposits and fossils.]

10 **Agassiz (Louis).**
On Glaciers, and the evidence of their having once existed in Scotland, Ireland, and England. *Proc. Geol. Soc. Lond.*, III. *ii.*, 327—332. 1840-41. [Brief ref. to Irish striated rocks].

11 —
The Glacial Theory and its recent Progress. *Edinb. New Phil. Journ.*, XXXIII., 217—288. 1842. [Brief ref. to Irish erratics, p. 223.]

12 **Ainsworth (W.).**
An Account of the Caves of Ballybunian, Co. Kerry, with some mineralogical Details. 96 pp. 8vo. Dublin, 1834. [Descr.]

13 **Allman (G. J.).**
Notice of erratic blocks of greenstone, occurring in the neighbourhood of Bandon, County Cork. (Abstract.) *Journ. G.S.D*, III., 242. 1847.

14 **Andrews (Mary E.).**
Denudation at Cultra, Co. Down. *I.N.*, II., 16—18, 47—49, plate. 1893; and *Proc. B.N.F.C.*, (2) III., 529—532, plate (for 1892-93), 1893. [Post-glac. denudation.]

15 **Andrews (Thomas).**
On some Caves in the Island of Rathlin and the adjoining Coast of the County of Antrim. *Brit. Assoc. Report for* 1834, 660. 1835. [Short abstract: general descr.]

16 —
On the Composition of an Inflammable Gas Issuing from below the Silt-Bed of Belfast. *Proc. B.N.H. & P.S. for* 1873-74, 93—94. 1874.

17 **Andrews (W.).**
On Oyster Deposits. *Journ. R.G.S.I.*, II., 13—15. (read 1867). 1871. [Those of Kenmare river are quite recent.] [For discussion on this paper see same vol., p. 132.]

Anon.
A Philosphical Survey of the South of Ireland . . . (1788), see **Campbell (755).**

—
A Tour through Ireland . . . . (1780), see **Luckombe (760).**

—
Excursions through Ireland [1818], see **Cromwell (754).**

18 —
Fossil Deer of Ireland. *Dublin Phil. Journ. & Scient. Review*, I., 478—486. 1825; reprinted in *Annals of Philosophy*, n.s. XI., 305—312. 1826. [Edit. notes, and extracts from Maunsell (**503**) and Hart (**266**).]

19 —
Kingston Cave. *Dublin Penny Journ.*, II., No. *61*, 65—66. Aug. 31, 1833. [Discovery and descr. of Mitchelstown cave.]

20 —
Stalactite Cavern at Mitchelstown. *Dublin Penny Journ.*, III., No. *130*, 201—208, maps. Dec. 27, 1834. [Ed. note: letter from Dr. Nichol: anon. letter: paper by Dr. Apjohn, reprinted (**28**).]

21 —
Remarkable Discovery of Fossil Remains. *Farmer's Gazette*, V., 487, Nov. 28, 1846. Reprinted in *Zool.*, V., 1593—1595, 1847, under the title "Discovery of the Bones of Deer and Cattle at Lough Gur." [Descr. of Lough Gur find by an eye-witness.]

22 —
Ancient Lake-habitations of Switzerland and Ireland. *Ulst. Journ. Arch.*, VII., 179—194. 1859. [Descr. of several Irish crannogs.]

23 Anon.

Human Remains. *Geologist* for 1862, 353. [Human body in gravel below 11 feet of bog, Earl of Moira's estate, Co. Down].

24 —

[Skeleton and horns of Irish deer in "soil" at bottom of pond, Fethard, Co. Tipperary]. *Dublin Evng. Telegraph*, Nov. 6, 1884.

25 —

Finds of Elkheads, &c. [Note.] *Proc. & Papers R.S.A.I.*, (5) I., (1890-91), 485. 1892. [At Cappagh Bog, Adare, Co. Limerick.]

26 —

General Guide to the Science and Art Museum, Dublin. 8vo. Dublin, 1892. [Preface by V. Ball.] [List with locs. of Fossil Mammals of Ireland, pp. 23—25.]

27 Antisell (T.).

Irish Geology, in a series of chapters, containing an outline of the science of Geology, and a description of the various rocks distributed on the surface of the Island, with some remarks on the climate. 84 pp. 12mo. Dublin, 1846. [Chap XI., Tertiary system.]

28 Apjohn (J.).

On the newly discovered Cave situate between Cahir and Mitchelstown. *Journ. G.S.D.*, I. (1833—38), 103—111 (read 1834), 1838; reprinted with illustr. in *Dublin Penny Journ.*, III. No. *130*, Dec. 27, 1834 (see **20.**)

29 Archer (F.).

Notes on the Worked Flints of the Raised Beaches of the N.E. Coast of Ireland. *Proc. L'pool Geol. Soc.*, IV. *iii.* (1880-81), 209—216. 1881. [Good descr., Larne, Kilroot, &c.]

30 Atkinson (George M.).

Kitchen Middens in the Estuary of Cork Harbour. *Journ. R.H. & A.A.I.*, (4) II. *ii.* (1873), 258—261, plate. 1874. [Descr., lists of shells, &c.]

31 Baily (William Hellier).

Sketch of the Geology of Belfast and the Neighbourhood. *Hardwicke's Science Gossip for* 1874, 169—170. 1874. [Ref. to post-glac. deposits.]

32 —

Sketch of the Geology of Dublin and Wicklow. *Hardwicke's Science Gossip for* 1878, 179—183. 1874. [Short descr., glac. & post-glac. beds.]

33 —

Palæontology of County Dublin; [being pp. 48—72 of *Guide to the County of Dublin.*] 8vo. 1878. Also published in *Sci. Proc. R.D.S.*, n.s. I., 162—182, 1878, and in *Journ. R.G.S.I.*, V., 78—98. 1880. [Lists of glacial fossils from Killiney, Howth, and high-level gravels.]

34 —

Rambles on the Irish Coast. 8vo. Dublin, 1886. [Drift deposits, pp. 40—42.]

35 Ball (John).
Notice of the former existence of small glaciers in the County of Kerry. *Journ. G.S.D.*, IV., 151—154. 1849.

36 Ball (Robert).
On the Remains of Oxen found in the Bogs of Ireland. *Proc. R.I.A.*, I., 253—254. 1832. [Characters and distribution.]

37 —
On the Bones of Oxen found in the Bogs of Ireland. (Abstract.) *Journ. G.S.D.*, III., 50—51. 1844. [*Bos longifrons.*]

38 —
On the Skulls of Bears found in Ireland. *Proc. R.I.A.*, IV., 416—420 (read 1849). 1847-50. Reprinted in *Ann. & Mag. Nat. Hist.*, (2) V., 234—236. 1850. [Two skulls of *U. arctos* from Westmeath. Letter from R. OWEN.]

39 Ball (Valentine).
On the Collection of the Fossil Mammalia of Ireland in the Science and Art Museum, Dublin. *Sci. Trans. R.D.S.*, (2) III., 333—350, plate 11. 1885. [Full catalogue; bibliography.]

40 —
On Bones and Antlers of *Cervus giganteus* incised and marked by Mutual Attrition while buried in Bogs or Marl. *Brit. Assoc. Report for* 1898, 756. 1894. [Longford and Limerick.]

—
See General Guide to S. & A. Museum (**27**).

41 Barker (John).
[Discussion on indented bones of *Megaceros.*] *Journ. G.S.D.*, X. (1862-64), 169. 1864.

42 Bannon (Bernard).
[Exhibited wrought stake found 25 feet below bog, Co. Fermanagh.] *Journ R.H. & A.A.I.*, V. *iii.* (for 1881), 500—501. 1882.

43 Belfast Natural History and Philosophical Society.
[Presentation of *Megaceros* bones from branch dock, Belfast, by R. LLOYD PRAEGER.] *Proc. for* 1891-92, 11. 1893.

44 —
[Presentation of bones and shells from Rosapenna Kitchen-middens by W. H. PATTERSON; *Megaceros* bones from Belfast by R. M. YOUNG; other bones from same place by S. F. MILLIGAN.] *Proc. for* 1893-94, 9. 1894.

45 Belfast Naturalists' Field Club.
Guide to Belfast and the adjacent Counties. 8vo. Belfast, 1874. [Genl. descr. of glac. and post-glac. deposits of Down and Antrim, pp. 68—77.]

—
Systematic Lists illustrative of the Flora, Fauna, Palæontology, and Archæology of the North of Ireland. By Members of the Belfast Naturalists' Field Club. 8vo. Vol. 1. (1870-1886). 1886. See **Stewart (636,637), Wright (734).**

46 Belfast Naturalists' Field Club.
[Excursion to Kilroot]. *4th Ann. Report* (for 1866-67), 6. 1867. [Flint-flakes from near Carrickfergus.]

47 —
[Ref. to Woodburn boulder clay and fossils.] *4th Ann. Report* (for 1866-67), 16. 1867.

48 —
Excursion to Castle Espie. *5th Ann. Report* (for 1867-68), 15–16. 1868. [Ref. to glac. beds and flint-flakes.]

49 —
Excursion to Toome. *5th Ann. Report* (for 1867-68), 7—8. 1868. [Ref. to occurrence of flint-flakes.]

50 —
[Ref. to submerged peat and raised beach, Portrush.] *6th Ann. Report* (for 1868-69), 10. 1869.

51 —
Excursion to Gobbins. *6th Ann. Report* (for 1868-69), 13. 1869. [Ref. to glac. beds.]

52 —
Excursion to Larne. *7th Ann. Report* (for 1869-70), 23. 1870. [Curran gravels and implements.]

53 —
Excursion to Ballintoy. *8th Ann. Report* (for 1870-71), 16. 1871. [Flint-flakes, &c.]

54 —
Excursion to Broughshane, &c. *9th Ann. Report* (for 1871-72), 15. 1872. [Flint-flakes, &c., at Ticloy.]

55 —
Excursion to Enniskillen, &c. *10th Ann. Report* (for 1872-73), 23. 1873. [Caves near Marble Arch.]

56 —
[Ref. to Ballyruther gravels and mammoth remains.] *Proc.*, (2) I., 166—167 (for 1875-76). 1876.

57 —
Excursion to Killyleagh, &c. *Proc.*, (2) I., 245 (for 1876-77). 1878. [Glac. beds of Strangford Lough.]

58 —
Excursion to Greenore. *Proc.*, (2) I., 332 (for 1878-79). 1879. [Raised beach, implements, striæ.]

59 —
Excursion to Toome. *Proc.*, (2) I., 401—402 (for 1879-80). 1881. [Diatomaceous earth, implements.]

60 —
Excursion to Dromore. *Proc.*, (2) II., 9 (for 1880-81). 1882. [Irish elk.]

61 **Belfast Naturalists' Field Club.**
Excursion to Cultra. *Proc.*, (2) II., 13 (for 1880-81). 1882. [Flint implements.]

62 —
Excursion to Woodburn. *Proc.*, (2) II., 94—95 (for 1881-82). 1883. [Boulder clay.]

63 —
Excursion to Ballycastle. *Proc.*, (2) II., 102—104 (for 1881-2). 1883. [Ice-action at Fairhead. Sandhill sites at White Park Bay.]

64 —
Excursion to Larne. *Proc.*, (2) II., 107—108 (for 1881-2). 1883. [Raised beach, estuarine clay, implements.]

65 —
Excursion to Cultra. *Proc.*, (2) II., 225—226 (for 1883-84). 1884. [Boulder clay with erratics. Implements.]

66 —
Excursion to Ram's Island. *Proc.*, (2) II., 229 (for 1883-84). 1884. [Boulder clay with erratics.]

67 —
Excursion to Toome. *Proc.*, (2) II., 416 (for 1885-86). 1886. [Boulder clay, marl, peat.]

68 —
Excursion to Mourne Mountains. *Proc.*, (2) II., 420 (for 1885-86). 1886. [Glaciation of the range.]

69 —
Excursion to Greyabbey. *Proc.*, (2) II., 428 (for 1885-86). 1886. [Butterlump stone, a large erratic.]

70 —
Excursion to Knockagh. *Proc.*, (2) II., 508 (for 1886-87). 1887. [Sea-caves at 600 feet].

71 —
Excursion to Portaferry, &c. *Proc.*, (2) III., 18 (for 1887-88). 1888. [Raised beach, Ballyquintin.]

72 —
[Ref. to Stoneyford boulder clay.] *Proc.*, (2) III., 91 (for 1888-89). 1889.

73 —
Excursion to Scrabo. *Proc.*, (2) III., 169—170 (for 1889-90). 1890. [Boulder clay.]

74 —
Excursion to Mourne Mountains. *Proc.*, (2) III., 181 (for 1889-90). 1890. [Ice-moulding on Moolieve.]

75 —
Excursion to Kilroot. *Proc.*, (2) III., 257—261 (for 1890-91). 1891. [Raised beaches, Kilroot and Whitehead.]

76 Belfast Naturalists' Field Club.
Excursion to Magheramorne. *Proc.*, (2) III., 265 (for 1890-91). 1891. [Boulder clay overlying gravel in quarry.]

77 —
Excursion to Glenarm. *Proc.*, (2) III., 276 (for 1890-91). 1891. [Ballyrudder glacial gravels.]

78 —
Excursion to Killyleagh. *Proc.*, (2) III., 354 (for 1891-92). 1892. [Boulder clay on Dunnyneile Island.]

79 —
Excursion to Enniskillen, &c. *Proc.*, (2) III., 362 (for 1891-92). 1892. [Cave near Marble Arch.]

80 —
Excursion to Whitepark. *Proc.*, (2) III., 466 (for 1892-93). 1893. [Sand-hill settlements.]

81 —
Excursion to Killough &c. *Proc.*, (2) III., 494 (for 1892-93). 1893. [Glacial section north side Killough Bay.]

82 —
Excursion to Portaferry, &c. *Proc.*, (2) IV., 21 (for 1893-94). 1894. [Glaciation at Ballyquintin.]

83 —
Excursion to Dundrum, &c. *Proc.*, (2) IV., 183 (for 1894-95). 1895. [Raised beach of Newcastle sand-hills.]

84 —
Excursion to Templepatrick (Geol. Section). *I.N.*, IV., 343. 1895. [Boulder clay, erratic.]

—
See **Kendall (368).**

85 Bell (Alfred).
The Palæontology of the Post-glacial Drifts of Ireland. *Geol. Mag.*, X., 447-453. 1873. [General descr. and lists of fossils.]

86 —
Irish Drifts. *Geol. Mag.*, (2) X., 336. 1883. [Portlock's glacial fossils—reply to Swanston.]

87 —
First Report of the Committee . . . upon the "Manure" Gravels of Wexford. *Brit. Assoc. Report for* 1887, 209—211. 1888. [General descr.]

88 —
Second Report do. do. do. *Brit. Assoc. Report for* 1888, 133—141. 1889. [Wexford, Killiney, Bray; details, fossils.]

89 —
Third Report do. do. do. *Brit. Assoc. Report for* 1889, 92—93. 1890 [General conclusions.]

90 Bell (Alfred).
Fourth and Final Report do. do. do. *Brit. Assoc. Report for* 1890, 410—424. 1891. [General descr. and fossil lists, Pliocene, glac., and post-glac. beds, Wexford to Portrush.]

91 —
Notes upon the Marine Accumulations in Largo Bay, Fife, and Portrush, Co. Antrim. *Proc. R. Phys. Soc. Edinb.*, X. *ii.* (for 1889-90), 290—297. 1891. [Lists of fossils.]

92 —
Notes on the Correlation of the later and Post-Pliocene Tertiaries on either side of the Irish Sea, with a Reference to the Fauna of the St. Erth Valley, Cornwall. *Proc. R.I.A.*, (3) II., 620—642. 1893. [Correlations and fossil lists.]

93 Bell (Robert G.).
Notes on Pliocene Beds. *Geol. Mag.*, (3) IV., 554—558. 1887. [Ref. to Wexford reversed *Fusus*, p. 557.]

94 Benn (Edward).
[Contemporaneity of Man and *Megaceros* in Ireland.] *Proc. Kilk. Arch. Soc.*, I. (1856-57), 155—159. 1858.

95 —
Observations on Irish Crannogs. *Journ. Kilk. Arch. Soc.*, III. (1860-61), 86—90. 1861. [Animal remains, &c.]

96 —
On flint implements found in the County of Antrim. *Proc. Kilk. Arch. Soc.*, V. *ii.*, 294-300. 1865. [Ref. to mode of occurrence.]

97 Birmingham (John).
The Drift of West Galway and the Eastern Parts of Mayo. *Journ. G.S.D.*, VIII.,28—38 (1858), 111—114 (1859). 1860; also *Brit. Assoc. Report for* 1857, *Sections*, 64—65. 1858 [abstract]. [Sequence of beds, &c.]

98 Blyth (Edward).
[Remarks on Bears' bones.] *Journ. G.S.D.*, X. (1862-64), 174. 1864. [From Co. Limerick.]

99 —
On the Animal Inhabitants of Ancient Ireland. *Proc. R.I.A.*, VIII., 472—476. 1861-64; and *Dublin Q.J.S.*, IV., 149—152. 1864. [*Bos* and *Megaceros* chiefly.]

100 Boate (Gerard), Thomas Molineux, and others.
A Natural History of Ireland in three parts. 4to. Dublin, 1755. [Letter of Francis Nevil to the Bishop of Clogher on the Maghery find of elephant's teeth (**522**), and Dr. Molyneux's remarks thereon (**509**), with plate, (reprinted from *Phil. Trans.* XXIX.). Discourse concerning the large Horns frequently found under ground in Ireland . . . by Thomas Molyneux (**508**), with plate. (reprinted from *Phil. Trans.* XIX.).]

Bogs, Report of Commission on.
See **Commissioners (143).**

101 Boulger (G. S.).
Irish Cave Exploration. *Nature*, XII., 212. 1875. [Short letter on Shandon cave.]

***102 —**
Cave Hunting in Ireland [abstract]. *Proc. West London Scient. Assoc.*, I., 29—31. 1875. [Shandon cave.]

103 —
The first Irish Cave Exploration [abstract]. *Proc. Geol. Assoc.*, IV., No. 8, 524—526. 1876. [Shandon. Descr. and animal remains.]

104 Brady (George Stewardson), Henry William Crosskey, and David Robertson.
Monograph of the Post-tertiary Entomostraca of Scotland, including species from England and Ireland. *Palæontographical Soc.*, XXVIII., 1874. [Lists of species from Woodburn boulder clay, Portrush raised beach, and Belfast estuarine clay.]

105 Brash (Richard Rolt).
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106 Brenan (Edward).
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108 Bryce (James).
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On Flint workshop sites at Glenhue, County Antrim. *Journ. R.H. & A.A.I.*, (4) VI. *i.* (1883), 120—126. 1884. [Surface finds.]

113 **Buick** (Rev. **George Raphael**).
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114 —
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[Memorandum on crannog finds]. *Proc. R.I.A.*, V. (1850-53). 214—215 (read 1851). 1853.

117 **Busk** (**George**).
Report on the Animal Remains [of Brixham Cave]. *Phil. Trans.*, CLXIII., 499—572. 1873. [Ref. to Irish bears' skulls, p. 543.]

C. (**J.**) see **Coleman** (**140,141**).

118 **Campbell** (**J. F.**).
On the Glaciation of Ireland. *Q.J.G.S.*, XXIX., 198—225. 1873. Abstract in *Geol. Mag.*, X., 127. 1873. [Full paper: general glaciation, &c.]

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120 **Carte** (**Alexander**).
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[Remarks on deer remains]. *Journ. G.S.D.*, X. (1862-64), 166 (read 1863). 1864. [From Cos. Limerick and Dublin.]

122 —
On the Remains of the Reindeer which have been found fossil in Ireland. *Journ. G.S.D.*, X. (1862-64), 103—107 (read 1863). 1864; and *Dublin Q.J.S.*, IV., 103—107, plate 3. 1864.

123 —
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125 Carte (Alexander).

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126 Charnock (R. S.).

[Presented and described a greenstone celt from Toome, found with many implements and a canoe, 10—12 feet below bed of Lough Neagh.] *Proc. Soc. Ant. London for* 1861-64, (2) *ii.*, 119.

127 Clarke (Dr. —).

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128 Close (Rev. Maxwell H.).

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[Note on discovery of skull of *Megaceros* 8 feet below peat in a stratum of cockle-shells at Toryhill, Co. Kilkenny.] *Trans. Kilk. Arch. Soc.*, I. *iii.* (for 1851), 388. 1852.

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[Exhib. Ailsa Craig rock, from Killiney and Greystones.] Dublin Micro. Club, in *I.N.*, II., 172. 1893.

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Islands of Oyster Shells. [note]. *Journ. Cork Hist. & Arch. Soc.*, II., 59. 1893. [Kitchen-middens in Cork Harbour.]

142 Coleman (James).
Additional Irish Caves. *I.N.*, IV., 94. 1895. [In Cork and Kerry.]

143 Commissioners appointed to inquire into the nature and extent of the several **Bogs in Ireland**, and the practicability of draining and cultivating them: 1st, 2nd, 3rd, and 4th Reports. Folio. 1810-14. [Many maps and sections.]

144 Conwell (Eugene A.).
On a Fossil Mussel-shell found in Drift in Ireland. *Brit. Assoc. Report for* 1869, *Sections*, 87. 1870. [A fresh shell from base of an esker near Trim.]

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Researches in the South of Ireland. 4to. London, 1824. [Caves at Cloyne: cave at Castlemartyr with skeleton covered with gold plates, pp. 251—253.]

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Crosskey (Henry William), see **Brady**, &c. **(104).**

148 Cruise (Richard J.).
Explantatory Memoir to accompany sheets 89 and 90 of the Maps of the Geological Survey of Ireland, illustrating parts of the counties of Longford, Westmeath, and Meath. 8vo. 1872. [Glac. & post-glac. 24—26.]

149 Cruise (Richard J).
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Observations on the Distribution of the extinct Bears of Britain, with especial reference to a supposed new Species of Fossil Bear from Ireland. *Proc. Geol. & Polytechnic Soc. of W. Riding of Yorks.*, IV. (1859-68), 338—358, plate 10 (read 1864). 1869. [Brenan's Shandon specimens.]

165 Dickie (George).
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186 **Egan (F. W.).**
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194 **Evans (John).**
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196 **F. (J.).**
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197 **Firth (William A.) and William Swanston.**
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See **Foot (758), Jukes (346, 347), Kinahan (425, 426).**

205 [**Foot (Frederick J.), and J. Beete Jukes.**]
Explanations to accompany sheets 131 and 132 of the maps of the Geological Survey of Ireland, illustrating part of the County of Clare. 8vo. 1860. [Glac. & post-glac. 20—21. Marl shells.]

206 [**Foot (Frederick J.) and George Henry Kinahan.**]
Do. do. sheet 133 do. do. illustrating a portion of the County of Clare. 8vo. 1862. [Glac. & post-glac. 32—34. *Megaceros.*]

207 [**Foot (Frederick J.), J. Beete Jukes, and Richard Glascott Symes.**]
Do. do. sheets 96, 97, 106, and 107 do. do., illustrating parts of the counties of Galway and Roscommon. 8vo. 1867. [Glac. & post-glac. (eskers chiefly) 23—38; marl shells.]

208 **Foot (Frederick J.) and J. O'Kelly.**
Do. do. sheets 98, 99, 108, and 109 do. do., illustrating parts of the Counties of Westmeath, Roscommon, Galway, Longford, and King's County. 8vo. 1865. [Glac. & post-glac. (eskers chiefly) 20—35.]

209 [**Foot (Frederick J.), J. O'Kelly, and J. Beete Jukes.**]
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211 **Frazer (William).**
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213 **Geikie (James).**
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214 —
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215 **Geinitz (H. B.).**
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216 Geological Society of Dublin.
[Reindeer head and horns found near Ashbourne, Co. Dublin, exhibited.] *Journ. G.S.D.*, X., 70. (1862). 1864.

217 Geological Survey of Ireland: Maps.
205 coloured sheets, 1855-1890. [Drift, raised beach, alluvium, bog, are marked.]

Geological Survey of Ireland: Memoirs.
See **Cruise (148 to 152), Du Noyer (173 to 175, 178), Egan (186 to 192), Foot (200 to 202, 205 to 209), Hardman (257, 259), Hull (295, 300, 301, 304 to 311), Jukes (322, 327, 328, 334 to 360), Kilroe (369), Kinahan (371, 376, 382, 407, 411, 424 to 434), Leonard (469, 470), Mitchell (505, 506), Nolan (525 to 529), O'Kelly (531 to 533), Symes (645 to 655), Traill (667), Wilkinson (716 to 721), Wynne (736, 742).**

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225 Graves (Rev. **James**).
[Notes on Antiquities from crannog, Ballinderry Lough, Co. Westmeath.] *Journ. R.H. & A.A.I.*, (4) II. i. (1883), 196—202. 1884.

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227 Gray (William).
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345 [— — —]
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Do. do. sheets 200, 203, 204, and 205, and part of 199 do. do., illustrating part of the County of Cork. 8vo. 1861. [Glac., Chalk flints 17; glac. & post-glac. 19—20.]

351 [**Jukes (Joseph Beete,) G. H. Kinahan, and G. V. Du Noyer.**]
Do. do. sheet 137 (formerly quarter sheet 40 N.E.) do. do. 8vo. 1859. [Kilkenny, Carlow, Queen's Co., Kildare. Denudation 5—8; sections 25—48; glac. and post-glac. 49—51.]

352 [**Jukes (Joseph Beete), G. H. Kinahan, and J. O'Kelly.**]
Do. do. sheets 197 and 198, and the south-east part of 191 do. do., illustrating part of the Counties of Cork and Kerry. 8vo. 1860. [Glac. & post-glac. 28—29.]

353 [**Jukes (Joseph Beete), G. H. Kinahan, and A. B. Wynne.**]
Do. do. sheet 144 do. do., illustrating parts of the Counties of Limerick, Tipperary, and Clare. 8vo. 1860. [Glac. & post-glac. 34—36: *Megaceros.*]

354 [**Jukes (Joseph Beete), and J. O'Kelly.**]
Do. do. sheet 154 do. do., illustrating part of the Counties of Limerick and Tipperary. 8vo. 1861. [Glac. & post-glac. 27.]

355 [**Jukes (Joseph Beete), and A. B. Wynne.**]
Do. do. sheet 164 do. do., illustrating parts of the Counties of Cork and Limerick. 8vo. 1859. [Glac. & post-glac. 20—21: *Megaceros.*]

356 [**Jukes (Joseph Beete)**, and **A. B. Wynne.**]
Do. do. sheet 135 do. do., illustrating parts of the county of Tipperary, and of King's and Queen's Counties. 8vo. 1860. [Glac. & post-glac. 30—32.]

357 [— —]
Do. do. sheet 188 and 189 do. do., illustrating parts of the Counties of Cork and Waterford. 8vo. 1861. [Glac. & post-glac. 20—21.]

358 [— —]
Do. do. sheets 176 and 177 do. do., illustrating parts of the Counties of Cork, Waterford, and a small portion of Tipperary. 8vo. 1861. [Glac. & post-glac. 28—29.]

359 [**Jukes (Joseph Beete), A. B. Wynne,** and **G. H. Kinahan.**]
Do. do. sheets 182, 183, 190, and parts of 172 and 191 do. do., illustrating the part of the County of Kerry, containing the Promontory of Iveragh and Dunkerron. 8vo. 1861. [Form of ground 5—8; glac. & post-glac. 31—34.]

360 [**Jukes (Joseph Beete), A. B. Wynne,** and **J. O'Kelly.**]
Do. do. sheet 145 do. do., illustrating part of the county of Tipperary. 8vo. 1860. [Glac. & post-glac. 30—31.]

361 **Kane (Sir Robert).**
The Industrial Resources of Ireland. 2nd ed. 8vo. Dublin, 1845. [Refs. to bogs, clays, &c.]

362 —
Anniversary Address [to Roy. Geol. Soc. I.]. *Journ. R.G.S.I.*, IV., 104—111. 1877. [Review of papers read.]

363 **Kelly (Dennis H.).**
[Account of an artificial Island, and certain Antiquities, recently discovered near Strokestown, County Roscommon.] *Proc. R.I.A.*, V. (1850-53), 208—214 (read 1851). 1853. [Bones of Elk, &c.]

364 **Kelly (John).**
An Account of the Strata met with in digging for Marle, and of Horns found under Ground in Ireland; in a letter to the Rt. Hon. Edward Southwell, Esq. *Phil. Trans.*, XXXIV. (1726-27), 122—123, plate. 1728. [*Megaceros.*]

365 **Kelly (John).**
On the Drift of the District about Rathfarnham in the County of Dublin. *Journ. G.S.D.*, VI., 133—165, map, &c. (read 1854). 1856. [Full descr., &c.]

366 **Kendall (Percy F.).**
Glacial Geology, Old and New. *Geol. Mag.*, (3) IX., 491—500. 1892. [Ref. to Irish beds.]

367 —
On the Glacial Geology of the Isle of Man. *Yn Lioar Manninagh, the Journal of the Isle of Man Natural History and Antiquarian Society*, I., 397—438, plate, maps. 1894. [Refs. to Ireland, pp. 12, 38, plate.]

368 Kendall (Percy F.).

Erratic Blocks of England, Wales, and Ireland. Twenty-third Report of the Committee . . . . . [Advance copy] *Brit. Assoc. Report for* 1895. [Report from B.N.F.C. on N. of Ireland erratics.]

369 Kilroe (James R.).

Explanatory Memoir to accompany sheet 55 of the Maps of the Geological Survey of Ireland, comprising parts of the counties of Sligo and Leitrim. 8vo. 1885. [Glac. & post-glac. 26—28.]

370 —

Directions of the Ice Flow in the North of Ireland, as determined by the Observations of the Geological Survey. *Q.J.G.S.*, XLIV., 827—833. 1888; and *Sci. Proc. R.D.S.*, n.s. VI., 259—262 (read 1888). 1888-90.

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See **Egan (192), Hull (306, 307), Symes (650, 654), Wilkinson (718 to 721).**

371 Kinahan (George Henry).

Explanation to accompany sheet 124 and that part of sheet 125 that lies on the west of Lough Derg of the maps of the Geological Survey of Ireland, illustrating parts of the counties of Galway and Clare. 8vo. 1863. [Caves 7; glac. & post-glac., *Megaceros*, 47.]

372 —

On Crannogs in Lough Rea. *Proc. R.I.A.*, VIII. (1861-64), 412—427 (read 1863). 1864. [Co. Galway, descr. & finds.]

373 —

On the Eskers of the Central Plain of Ireland. *Journ. G.S.D.*, X., 109—112 (read 1863). 1864; and *Dublin Q.J.S.*, IV., 109—112. 1864. [Classification: marine origin, &c.]

374 —

[Irish Drifts—a letter.] *Geol Mag.*, II., 91—93. 1865. [Classification.]

375 —

On Pre-glacial (?) Drift in Queen's county. *Geol. Mag.*, II., 442—444. 1865. ["Stratified drift" under "boulder clay."]

376 —

Explanation to accompany sheets 115 and 116 of the maps, and sheets 17 and 18 of the sections of the Geological Survey of Ireland, illustrating a portion of the counties of Clare, Galway, and Tipperary. 8vo. 1865. [Caves, crannogs 7—9, 36—38; glac. & post-glac., marl shells, 13—15, 26—36; striæ 27.]

377 —

Primary and Secondary Striæ [a letter.] *Geol. Mag.*, II., 525. 1865. [Co. Galway.]

378 —

Notes on some of the Drift of Ireland. *Journ. R.G.S.I.*, I., 191—207 (read 1866). 1867; and *Dublin Q.J.S.*, VI., 249—265. 1865. [Full paper: classification of drift.]

379 **Kinahan (George Henry).**
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380 —
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383 —
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384 —
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385 —
[Observations on the exploration of Crannogs.] *Journ. R.H. & A.A.I.*, (4) I. *ii.*, 459—460. 1871.

386 —
Æolian Drift or Blowing Sand, Ireland. *Geol. Mag.*, VIII., 155—158. 1871. [Descr. and origin of sand deposits]

387 —
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388 —
Supplementary Notes on some of the Drift of Ireland. *Journ. R.G.S.I.*, III., 9—15 (read 1871). 1873. [General.]

389 —
Glacialoid or Re-arranged Glacial Drift. *Geol. Mag.*, (2) I., 111—117, 169—174. 1874. [Post-glacial sea; Esker sea.]

390 —
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391 —
On the Origin of the Lagoon called The Fleet, Dorsetshire [a letter]. *Geol. Mag.*, (2) I., 189—190. 1874.

392 —
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393 **Kinahan (George Henry).**
The erroneous Nomenclature of the Drift [a letter]. *Geol Mag.*, (2) II., 328—331. 1875. [Ref. to Irish beds.]

394 —
Boulder Clay in Ireland [a letter]. *Geol. Mag.*, (2) II., 568—569. 1875. [The Irish succession.]

395 —
Valleys and their Relation to Fissures, Fractures, and Faults. 8vo. London, 1875. [Many refs. to glac. & post-glac. geology.]

396 —
On a Prehistoric Road, Duncan's Flow, Ballyalbanagh, Co. Antrim *Journ. Anthrop. Inst.*, V., 106—110. 1876. [Under 5 feet of bog.]

397 —
Irish Tide Heights and Raised Beaches. *Geol. Mag.*, (2) III., 78—82. 1876. [Table of tide heights; heights of tides and of raised beaches.]

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401 —
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402 —
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403 —
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404 —
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*407 **Kinahan (George Henry).**
Irish Drifts. *Land and Water*, Jan. 19, 1878.

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Explanatory Memoir to accompany sheets 169, 170, 180, and 181 of the map of the Geological Survey of Ireland, in the County of Wexford. 8vo. 1879. [Lagoons 5—6; glac. & post-glac. 12—14, 28—51.]

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411 —
[Remarks on Young's paper on wrought timber found in boulder clay (749).] *Journ. R.H. & A.A.I.*, (4) V. *iii.* (1881), 449—450. 1882. [An effect of weathering.]

412 —
Explanatory Memoir to accompany sheets 158 and 159 of the maps of the Geological Survey of Ireland, including the district around Enniscorthy, co. Wexford. 8vo. 1882. [Form of ground 7—8; glac. & post-glac. 19—37.]

413 —
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416 —
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Gravel Terraces; Valleys of the Mourne, Strule, and Foyle, Counties Tyrone and Donegal. *Sci. Proc. R.D.S.*, n.s. V., 636—638. 1886-87. [Description.]

*418 [—] [Nanahik, *Pseudonym*].
The Morrogh of Wicklow. *Land and Water*, XXIII., 45. 1887. [Formed by tides and winds.]

419 —
Large Irish Boulders [a letter]. *Geol. Mag.*, (3) V., 189. 1888. [Dimensions of large erratics.]

420 Kinahan (George Henry).
Economic Geology of Ireland. [Being vol. VIII. of *Journ. R.G.S.I.*] 8vo. Dublin, 1889. [Ref. to clays, &c.]

421 —
Kitchen Middens in co. Donegal. *I.N.*, III., 138. 1894. [General note.]

422
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423 —
Kitchen Middens, co. Donegal. *I.N.*, IV., 21. 1895. [Short note.]

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See **Adams (9), Foot (206), Hull (307), Jukes (348** to **353, 359), Kinahan (760), Trench (668), Ussher (681, 681).**

424 [Kinahan (George Henry) and **J. Beete Jukes).]**
Explanations to accompany sheet 143 of the maps of the Geological Survey of Ireland, illustrating part of the Counties of Clare and Limerick. 8vo. 1860. [Glac. & post-glac., *Megaceros*, 8—9, 33—34.]

425 [Kinahan (George Henry), J. Beete Jukes, and **F. J. Foot.]**
Do. do. sheet 152 do. do., illustrating part of the Counties of Kerry and Limerick. 8vo. 1860. [Glac. & post-glac. 26—27.]

426 [Kinahan (George Henry) and **F. J. Foot.]**
Do. do. sheet 142 do. do., illustrating parts of the Counties of Clare, Kerry, and Limerick. 8vo. 1860. [Glac. & post-glac. 39—40.]

427 Kinahan (George Henry), E. Leonard and **R. J. Cruise.**
Explanatory Memoir to accompany sheets 104 and 113 with the adjoining portions of sheets 103 and 122 (Kilkieran and Aran sheets) do. do., illustrating a portion of the County of Galway. 8vo. 1871. [Glac. & post-glac., sea-cliffs (Aran) 31—37; glac. & post-glac. (mainland), kitchen-middens 69—74; table of striæ 75—85.]

428 Kinahan (George Henry), and **Joseph Nolan.**
Explanation to accompany sheet 95 do. do. . . . . illustrating parts of the counties of Galway and Mayo. 8vo. 1870. [Lough Corrib islands 30—36; L. Mask islands 45; glac. & post-glac. 45—52: table of striæ 53—58.]

429 Kinahan (George Henry), J. Nolan, E. Leonard, and **R. J. Cruise.**
Explanatory Memoir to accompany sheets 93 and 94, with the adjoining portion of sheets 83, 84, and 103 do. do., illustrating the geological structure of the district around Clifden, Connemara. 8vo. 1878. [Drift bar 13; denudation 44—47; glac. & post-glac. 143—144; table of striæ 145—160.]

430 [Kinahan (George Henry,) J. O'Kelly, and **J. Beete Jukes.]**
Explanation to accompany sheet 153 do. do., illustrating parts of the Counties of Limerick and Cork. 8vo. 1861. [Glac. & post-glac. 28.]

431 Kinahan (George Henry) and **R. G. Symes.**

Explanatory Memoir to accompany sheets 86, 87, 88, and eastern part of 85 do. do., illustrating parts of the counties of Mayo, Galway, Roscommon, and Longford. 8vo. 1871. [Frontispiece, eskers; form of ground 7—9; glac. & post-glac. 49—54; striæ 39, 55—57]

432 Kinahan (George Henry), R. G. Symes, S. B. Wilkinson, Joseph Nolan, and **H. Leonard.**

Do. do. sheets 73 and 74 (in part), 83 and 84 do. do. including the Country around Westport, &c. 8vo. 1876. [Glac. & post-glac. 11, 69—75; table of striæ 75—82.]

433 Kinahan (George Henry), S. B. Wilkinson, J. Nolan, F. W. Egan [and **H. Hull**].

Do. do. sheet 17 and S. E. portion of sheet 11 do. do. 8vo. 1889. [Donegal, Derry, Tyrone. Phys. geogr. 5—6; glaciation 28; glac. & post-glac. 28—32]

434 [Kinahan (George Henry), A. B. Wynne and **J. Beete Jukes.]**

Explanations to accompany sheet 134 do. do., illustrating parts of the counties of Clare, Tipperary, and Limerick. 8vo. 1861. [Glac. & post-glac., *Megaceros*, 8—9, 29—31.]

435 Kinahan (Gerard A.).

"Black Sand" in the Drift north of Greystones, Co. Wicklow. *Sci. Proc. R.D.S.*, n.s. III., 165—168. 1883; and *Journ. R.G.S.I.*, VI., 111—114 (read 1881). 1886.

436 —

Some Notes on the Geology of Bray Head, with a Geological Map and Sections. *Journ. R.G.S.I.*, VI., 188—192, plate 7 (read 1882). 1886. [Ref. to glac. phenomena.]

437 Kinahan (John Robert).

[Exhibited series of fossils from the Marine Drift of Bohernabreena, Co. Dublin.] *Journ G.S.D.*, VIII. (1857-60), 87—88 (read 1858). 1860; also *Nat. Hist. Review*, V., 167—168. 1858. [Names and condition of the shells.]

438 —

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439 King (Prof. **William**).

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440 King (Right Rev. Dr. **William**), Archbishop of Dublin.

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441 Knowles (William James).

Works of Art found in the Boulder Clay at Cullybackey [abstract]. *7th Ann. Report B.N.F.C.* (1869-70), 35—36. 1870. [Co. Antrim. Concretionary nodules, and piece of wood supposed to be wrought.]

442 Knowles (William James).
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443 —
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444 —
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455 **Knowles (William James).**
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467 **Lentaigne (John).**
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468 **Leonard (Hugh).**
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469 **Leonard (Hugh).**
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See **Kinahan (427, 429, 432).**

Leonard (W. B.), see **Hull (308, 310, 311).**

470 **Leonard (W. B.),** and **R. J. Cruise.**
Explanatory Memoir to accompany sheets 78, 79, and 80 of the Maps of the Geological Survey of Ireland, including portion of the Counties of Roscommon, Leitrim, Longford, Cavan, and Meath. [Glac. & post-glac. 40.]

471 **Leslie (David).**
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472 **Lett (Rev. Henry William).**
Records of a Former Level of Lough Neagh. *Proc. B.N.F.C.*, (2) II., 117—118 (for 1881-82). 1883. [Submerged bog and forest, bordered by submerged cliff.]

473 —
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475 **Lewis (Samuel).**
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476 **Lockwood (Frederick W.).**
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477 —
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479 **Long (J.).**
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Prehistoric Times . . . . 8vo. London, 5th edition. 1890. [General ref. to Ireland.]

Luckombe (Philip), see **761.**

481 Lydekker (Richard).
Catalogue of the Fossil Mammalia in the British Museum, in 5 parts. 8vo. London, 1885-87. [Contains Irish localities, as in II., 82—89, *Cervus giganteus*.]

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483 L[ynch] (J. F.).
Lough Gur. *Journ. Cork Hist. and Arch. Soc.* (2) I., 241—258, 289—302. 1895. [Descr. and ref. to animal remains.]

484 MacAdam (James).
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History of Carrickfergus. 8vo. Belfast, 1811. [Submerged peat with calcified nuts, p. 110 (p. 225 of 2nd edition, 1823.).]

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[Annual] Address [to Geol. Soc. of Dublin.] *Journ. G.S.D.*, III., 215—235. 1847. [Review of papers read.]

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On the Remains of Man and Works of Art embedded in Rocks and Strata, as illustrative of the connection between Archæology and Geology. *Archæological Journal*, VII., 327—346. 1850. [Contemporaneity of Man and *Megaceros*.]

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[Letters to R.D.S. on presentation of Elk's bones.] *Proc. R.D.S.*, LX., 169—170, 211—212, 1824; LXI., 93—97, 1825. [Localities, &c.]

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Crannogs in County Cavan. *Journ. R.H. & A.A.I.*, (4) VII i. (1885), 148—152. 1887.

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[Letter on a timber structure below 4 feet of bog.] *Journ. R.H. & A.A.I.*, (4) I. i., 279. 1870. [Clonmacnoise, King's Co.]

508 Molyneux (Thomas).
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Mammoth's Tooth recently found in the drift gravels at Larne Harbour. *Proc. B.N.H. & P.S. for* 1888-89. 35—37. 1889. [In raised beach. Descr. of beds.]

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Report on the Exploration of Ballybetagh Bog. *Proc. R.I.A.*, (2) II° (*Science*), 547—552. 1875-77. [Descr., list of bones.]

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Description of an ancient Structure dug out of Drumkelin Bog, in the Parish of Inver, County of Donegal, in the year 1833. *Archæologia*, XXVI., 361—367 (read 1833). 1836. [Wooden house under 16 feet of bog.]

520 Mulvany (William T.).
Collection of antiquities presented to the Royal Irish Academy. *Proc. R.I.A.*, V. (1850-53), appendix V., 1853. [Some skulls, &c. included.]

521 Murray (William).
On some timber found at a considerable depth below the surface in the Co. of Tyrone. *Journ. G.S.D.*, III., 75. 1844. [Measured section; wood at 57 feet depth, in clays, &c.]

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See **Foot (208, 209), Jukes (343, 352, 354, 360), Kinahan (430).**

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535 Oldham (Thomas).
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On the Rocks at Bray Head. *Journ. G.S.D.*, III., 60—61. 1844. [Ref. to glaciation.]

537 —
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Some further remarks on the more recent Geological Deposits of Ireland. *Journ. G.S.D.*, III., 130—132. 1845. [Lists of shells from Dublin glac. beds, &c.]

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544 O'Reilly (J. P.).
Notes on Lithothamnion met with in deep cuttings at the mouth of the river Liffey. *Proc. R.I.A.*, (3) III., 223—224. 1893. [Section 24 ft. through post-glac. beds.]

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546 Ouseley (Ralph).
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Description and illustrated catalogue of the Fossil organic remains of Mammalia and Aves contained in the Museum of the Royal College of Surgeons of England. 4to. 1845. [Irish localities, as at pp. 255—261, *Megaceros Hibernicus*.]

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[Letter on Lough Gur find.] *Farmer's Gazette*, V., 523. Dec., 1846; reprinted in *Zool.*, V., 1620-1622. 1847.

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551 P.
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554 Patrickson (Major S.).

Description of a limestone District on the N.E. shore of Carlingford Lough, and of littoral Deposits of Shells and Limestone, &c. *Journ. G.S.D.*, I. (1833-38), 180—182. 1837. [Raised beach.]

555 Patterson (William Hugh).

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Notice of a Pre-Historic Site at Ballykinler, Dundrum Bay, County of Down. *Journ. R.S.A.I.*, (5) III., 80—81. 1893. [Flints, pottery, bones.]

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Shell-mounds at Rosapenna, North Donegal. *I.N.*, III., 49—51, plate 3. 1894; and *Proc. B.N.H. & P.S. for* 1893-94, 35. 1894. [Short abstract.] [Shells and bones.]

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See **Belfast N.H. & P.S. (44).**

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Extract of a letter from, to the Rev. Dr. Lort, on some large Fossil Horns. *Archæologia*, VII., 158—159. 1785. [*Megaceros* horns, size only.]

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Account of a human body in a singular costume found in a high state of preservation in a bog on the lands of Gallagh, in the county of Galway. *Dublin Phil. Journ. & Scient. Review*, I., 433—435. 1825. [Near bottom of bog 10 feet deep; clad in skins.]

560 Phayer (J. R.).

[Exhibited drawing of antler of Irish Elk found at Rathard, Tory Hill, Kilkenny.] *Journ. Kilk. Arch. Soc.*, I., 33. 1849.

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[Presented quern, &c. from crannog at Roughan Island near Dungannon.] *Proc. R.I.A.*, I., 457 (read 1840). 1841.

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564 —
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Remarks on the Recent Discovery of Remains of the Cervus Megaceros at Ballybetagh. *Proc. R.I.A.*, (2) II. (*Science*), 738—741. 1875-77. [Age and condition of the bones.]

568 **Porter** (Rev. **Thomas M.**).
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569 **Portlock** (General **Joseph E.**).
On the Study of Geological Phenomena in Ireland. *Journ. G.S.D.*, I., 1—15. 1833. [Post-glac. beds 14—15.]

570 —
On the Shelly Gravel underlying Dundalk. *Journ. G.S.D.*, I., 246—248 (read 1834). 1837. [Recent marine deposits.]

571 —
Address delivered at the 8th Annual Meeting of the Geol. Soc. Dublin. *Journ. G.S.D.*, II., 1—34. 1839. [Review of papers read.]

572 —
Report on the Geology of the County of Londonderry . . . 8vo. Dublin, 1843. [Ch. I. Review of works of preceding writers. Ch. VI., Tertiary—calcareous clays (with list of fossils, Portrush raised beach, by J. Smith). Ch. IX. p. 473, mammalian remains. Ch. XIII., Detritus. Appendix: addendum to Ch. VI., with Bryce and Hyndman's paper and list of fossils, Belfast Waterwork boulder clay (**111**).]

573 —
[Annual] Address [to Geol. Soc., Dublin.] *Journ. G.S.D.*, IV., 167—244. 1850. [Review of papers read.]

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575 Portlock (General **Joseph E.**).
Notice of Scratches upon the Rocks of Bantry Bay, and of some intrusions of Igneous Rocks among the Schists, and consequent disturbance of the strata. *Journ. G.S.D.*, V. (1850-53), 111—112 (read 1850). 1853. [Boulder clay and striated rocks.]

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On the Estuarine Clays at the new Alexandra Dock, Belfast. *Proc. B.N.F.C.*, (2) II., *Appendix for* 1886-87, 29—52. 1887. [Glac. & post-glac. beds: list of fossils.]

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Report of a Committee of Investigation on the Gravels and associated Beds of the Curran at Larne, Co. Antrim. *Proc. B.N.F.C.*, (2) III., 198—210, 2 plates (for 1889-90). 1890. [Descr. and lists of fossils.]

578 —
A Contribution to the Post-tertiary Fauna of Ulster. *Proc. B.N.F.C.*, (2) III., 215—218 (for 1889-90). 1890. [List of some estuarine clay shells, Derry, Antrim, and Down.]

579 —
On the Skull of an Irish Elk found at Belfast. *Proc. B.N.F.C.*, (2) III., 416—417 (for 1891-92). 1892. [In peat below 30 feet of marine clay.]

580 —
[Exhibited bones of Irish Elk.] *Proc. B.N.F.C.*, (2) III., 422—423 (for 1891-92). 1892. [From gravel below peat below marine clay at Belfast.]

581 —
Report on the Estuarine Clays of the North-east of Ireland. *Proc. R.I.A.*, (3) II., 212—289. 1892. [Full descr. and lists of fossils, Londonderry to Dundalk.]

582 —
The Irish Post-glacial Estuarine Deposits. *I.N.*, I., 138—141. 1892. [General descr.]

583 —
Report of the sub-committee appointed to investigate the Gravels of Ballyrudder, County Antrim. *Proc. B.N.F.C.*, (2) III., 518—525 (for 1892-93). 1893. [Glac. gravels. Descr. and lists of fossils.]

584 —
The Raised Beaches of Inishowen. *I.N.*, IV., 278—285. 1895. [Descr. and lists of fossils.]

585 —
The Mourne Mountains. *Proc. Geol. Assoc.*, XIV., 148—152. 1895. [Ref. to glac & post-glac. beds.]

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See **Belfast N.H. & P.S.** (**43**), **Sollas** (**626, 628, 629**).

586 **Reade (T. Mellard).**
Notes on the Scenery and Geology of Ireland. *Proc. L'pool. Geol. Soc.*, IV. *i.* (1878-79), 64—89. 1879. [Irish coast, Down to Clare *via* Donegal.]

587 —
On a section of Boulder-clay and Gravels near Ballygalley Head, and an Inquiry as to the proper Classification of the Irish Drift. *Q.J.G.S.*, XXXV., 679—681. 1879. [Descr.: fossils.]

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A Problem for Irish Geologists in post-glacial Geology. *Journ. R.G.S.I.*, V., 173–176. 1880; and *Sci. Proc. R.D.S.*, n.s. II., 255—258, plate 19. 1880. [Correlation of English and Irish beds.]

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On the Relations of the Glacial Deposits of the Clyde and Forth to those of the North-west of England and North of Ireland. *Trans. Geol. Soc. Glasgow*, VI. *ii.* (1878-9, '79-80), 264—276 (read 1880). 1882. [Descr. of beds, Antrim, Mayo, &c.]

590 —
Glacial Geology, Old and New. *Geol. Mag.*, (3) IX., 310—321. 1892. [Refs. to Irish Beds.]

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The Dublin and Wicklow Shelly-drift. *Proc. L'pool Geol. Soc.*, VII. *ii.* (1893-94), 183—206. 1894. [Descr. and fossils, high and low level beds, Howth and Glenasmole to Bray. Many illustr.]

592 —
Excursion to Belfast, Whitsuntide, 1893. *Proc. L'pool Geol. Soc.*, VII. *ii.* (1893-94), 226—227. 1894. [Glac. & post-glac. beds, Down and Antrim.]

593 —
The High and Low-level Shelly Drifts around Dublin and Bray. *I.N.*, III., 117—121, 150—153. 1894. [General descr.]

594 **Reeves (Rev. William)** [afterwards Bishop of Down and Connor and Dromore].
[Supplementary observations on Wilde's paper on certain Crannogs in Ulster (694).] *Proc. R.I.A.*, VII. (1857-61), 153—159 (read 1859). 1862. [Descr. of additional crannogs.]

595 —
An Account of the Crannoge of Inishrush and its ancient occupants. *Proc. R.I.A.*, VII. (1857-61), 212—217 (read 1859). 1862. [Near Portglenone, Co. Derry.]

596 **Reid (Clement).**
The Origin of Megaceros-Marl. *I.N.*, IV., 131—132. 1895. [Plants from marl, &c.]

597 **Richardson (H. D.).**
The Extinct Gigantic Deer [a letter]. *Farmer's Gazette*, V., 538—539. 1846. Reprinted in *Zool.*, V., 1623-1628. 1847. [Lough Gur find.]

598 **Richardson (H. D.).**
[Letter on Lough Gur find.] *Zool.*, V., 1628-1629. 1847.

599 —
Facts concerning the Natural History, &c. of the Gigantic Irish Deer (Cervus Megaceros Hibernicus). 54 pp. 8vo. Dublin, M'Glashan, 1846. [Age, distribution, &c.]

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Further Particulars of the Giant Deer of Ireland. *Zool.*, V., 1685-1686. 1847.

Robertson (David) see **Brady (104).**

601 **Robertson (J. G.).**
Cave of Dunmore. [Read before the Kilkenny Lit. and Scient. Institution, 31 March, 1854.] *Nat. Hist. Review* I., 169—174. 1854. [Descr.: animal remains.]

602 —
On the Cave of Dunmore. [Read before the Kilkenny Lit. and Scient. Institution, 28 April, 1854.] *Nat. Hist. Review*, I., 174—176. 1854. [Further particulars.]

603 **Rowan (Rev. A. H.).**
Limestone Boulders of Corkaguiny, County of Kerry. *Journ. G.S.D.*, V. (1850-53), 201—203 (read 1852). 1853. [Erratic blocks.]

604 **Rudler (F. W.).**
The Geology of Belfast. *Academy*, VI., 184—186. 1874. [Ref. to glac. geol.]

Ryland (Rev. R. H.) see **763.**

Savage (John) see **(764).**

605 **Scharff (Robert Francis).**
The Pre-Glacial British Fauna [a letter]. *Nat. Science*, III., 400. 1893. [Irish mammals.]

606 —
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607 —
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Cave at Ballymote, Co. Sligo. *I.N.*, IV., 94. 1895. [Short note. Bear's skull.]

Science and Art Museum, Dublin : Guides. See **Anon (26), Lydekker (481, 482).**

609 **Scott (Robert H.).**
Catalogue of the more remarkable instances of the finding of mammalian remains in Ireland. [In Report of Council, Geol. Soc. Dublin, for 32nd Session.] *Journ. G.S.D.*, X. (1862-64), 143—151. 1864. Reprinted under the title "Catalogue of the Mammalian Fossils which have been hitherto discovered in Ireland," in *Dublin Q.J.S.*, V., 49—56. 1865; and under a similar title in *Geol. Mag.*, VII., 413—420. 1870. [Much information.]

610 Scouler (John).
Remarks on the Natural History of the Fossil Elk. *Journ. G.S.D.*, I., 197—210 (read 1836). 1837.

611 —
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The Occurrence of Boulder Clay on Divis. *Proc. B.N.F.C.*, (2) IV. 215—216 (for 1894-95). 1895. [Marine clay at 1300—1400 feet, Co. Antrim.]

736 **Wynne (Arthur B.).**
Explanations to accompany sheet 126 (and the portion of 125 lying to the east of the Shannon) of the Maps of the Geological Survey of Ireland, illustrating parts of Tipperary and the King's and Queen's Counties. 8vo. 1862. [Glac. & post-glac. 9, 13—14; detailed descr. 14—36.]

737 —
Irish Drift Fossils. *Geologist for* 1862, 428—429. [*Mytilus* in gravel-pit south of Sligo.]

738 —
On the Geology of part of Sligo. *Brit. Assoc. Report for* 1862, *Sections*, 96—97. 1863. [Abstract]; also *Journ. G.S.D.*, X., 31—41 (read 1863). 1864; and *Dublin Q.J.S.*, III., 171—179. 1863. [Ref. to shelly drift and mammalian remains.]

739 —
On Denudation with Reference to the Configuration of the Ground. *Geol. Mag.*, IV., 3—11, plates 1—2. 1867. [Ref. to submerged peat, Youghal Bay.]

740 Wynne (Arthur B.).
On Disturbance of the Level of the Land near Youghal, on the South Coast of Ireland. *Q.J.G.S.*, XXIV., 4–8. 1868. [Glac. & post-glac. beds; shells.]

741 —
On the Disturbance of the Level of the Land near Youghal. [A letter.] *Geol Mag.*, V., 484—485. 1868. [Answer to criticisms by Greenwood.]

742 —
Explanatory Memoir to accompany sheets 42 and 43 of the Maps of the Geological Survey of Ireland, comprising portions of the Counties of Sligo and Leitrim. 8vo. 1885. [Glac. & post.-glac. 27—28; caves 28; striæ 30.]

743 —
Note on Submerged Peat Mosses and Trees in certain Lakes in Connaught. *Sci. Proc. R.D.S.*, n.s. V., 499—503. 1886-87; and *Journ. R.G.S.I.*, VII., 186—190. 1887.

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See **Jukes (343 to 345, 355 to 360), Kinahan (434), O'Kelly (533).**

744 Wynne (Very Rev. G. R.).
Traces of Ancient Dwellings in the Sandhills of West Kerry. [Note.] *Journ. R.S.A.I.*, (5) III., 78—80. 1893. [Bones, &c.]

Young (Arthur), see 767.

745 Young (Robert).
On the Eskers of the Central Plain of Ireland. *Brit. Assoc. Report for* 1852, *Sections*, 63—64. 1853. [Submergence theory.]

746 —
The recent Elevation of the Land in the Vicinity of Belfast. [Abstract.] *4th Ann. Report B.N.F.C.* (for 1866-67), 20—22. 1867. [General descr.]

747 —
The Boulder Clay of the Belfast District. [Abstract.] *8th Ann. Report B.N.F.C.* (for 1870—71), 32—35. 1871. [General.]

748 —
Some Remarks on the recent Changes of coast Level at Ballyholme Bay, Co. Down. *Proc. B.N.H. & P.S. for* 1871-72, 39—40. 1873. [Boulder clay, peat, raised beach.]

749 —
[Wrought logs in boulder-clay near Belfast.] *Journ. R.H. & A.A.I.*, (4) V. *ii.* (1880), 307—308. 1882.

750 —
Some Notes on the Upper Boulder Clay near Belfast. [Abstract.] *Proc. B.N.H. & P.S. for* 1889 90, 57. 1890.

751 —
Notes on the Geology of the Excavations for the Main Drainage Works [Belfast]. [Abstract.] *Proc. B.N.H. & P.S. for* 1890-91, 89. 1892.

752 Young (Robert Magill).
Brief Antiquarian Notes at Bushfoot and Ballymagarry [Co. Antrim]. *Proc. B.N.H. & P.S. for* 1892-93, 37—34. 1894. [Ref. to Bushfoot sandhill finds.]

753 —
On a Recent Find of Irish Elk Bones, &c., in Belfast. *Proc. B.N.H. & P.S. for* 1893-94, 76—78. 1894; and *I.N.*, III., 81—82. 1894. [In cuttings in Belfast streets.]

—
See **Belfast N.H. & P.S. (44).**

ADDENDA.

754 [Campbell (Thomas).]
A Philosophical Survey of the South of Ireland, in a series of Letters to John Watkinson, M.D. 8vo. Dublin, 1778. [Dunmore cave, p. 106.]

755 Carpenter (George Herbert).
Animals found in the Mitchelstown Cave. *I.N.*, III., 25—35, plate 1. 1895; reprinted (in part) in *Spelunga: Bulletin de la Société de Spéléologie*, I. i. Paris, 1895. [Present fauna.]

756 Close (Rev. Maxwell H.).
On the Geology of the Neighbourhood of Dublin as affecting its Sanitary Conditions. [Read Oct. 3rd, 1884, at Congress of the Sanitary Institute of Great Britain, held at Dublin. 8 pp. Authors's copy, headed "Excerpt from vol. VI. of the *Transactions*" &c.] [Descr. of beds underlying the city.]

757 [Cromwell (Thomas Kitson).]
Excursions through Ireland. 3 vols. 12mo., no date. [1818.] [Dunmore cave, II., p. 58.]

758 Foot (Frederick J.).
Natural History Notes on the Mammalia of the West coast of Clare. *Proc. Dublin Nat. Hist. Soc.*, III. (1859-62), 104—106. 1863. [Caves.]

759 Hardman (Edward T.).
The Limestone Caves of Sligo. [Appendix A. (pp. 375—378) of Wood-Martin's "History of Sligo," I. 8vo. Dublin, 1882. [Localities.]

760 Kinahan (George Henry) and M. H. Close.
The Glaciation of Iar-Connaught and its neighbourhood. 8vo. Dublin, 1872. [Important paper.]

761 [Luckombe (Philip).]
A Tour through Ireland, wherein the present state of that Kingdom is considered . . . . 12mo. Dublin, 1780. [Caves. Cork and Kerry, pp. 130—131, 134, 190, 282.]

762 Mallet (Robert).

On some Stalagmites from the Cave of Dunmore, County of Kilkenny. *Journ. G.S.D.*, III. iii., 262—263. 1846. [Short abstract.]

763 Ryland (Rev. R. H.).

The History, Topography, and Antiquities of the County and City of Waterford. 8vo. London, 1824. [Refs. to caves.]

764 Savage (John).

Picturesque Ireland . . . . 4to. New York, no date. [Bursting of a bog at Dunmore, North Galway, p. 264.]

765 White (Rev. P.).

History of Clare . . . . 8vo. Dublin, 1893. [Cave at Kiltannon, p. 2.]

766 Wood-Martin (Lt.-Col. W. G.).

History of Sligo, County and Town. [Vol. III]. 1688 to present time. 8vo. Dublin, 1892. [Ch. XXIV., Geology, &c.; boulder clay, bogs, raised beaches, crannogs, caves.]

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See **Hardman (759).**

767 Young (Arthur).

A Tour in Ireland . . . . made in the Years 1776, 1777, and 1778 and . . . 1779. 4to. London, 1780. [Mitchelstown cave, 380—381 (I., 464—465 of Hutton's ed., 1892).]

INDEX.

NOTE.—It must be understood that the following indexes, being compiled from the titles of the papers, and from the brief indication of their contents appended, are not exhaustive. They are intended as a rough guide to the papers, &c., dealing with any particular group of beds, or with any particular district. By consulting the papers indicated under any group, and also the papers indicated in the "general" list at the head of the section (A or B), a tolerably complete list will be obtained of papers dealing with the group in question; but for a complete list of references the Bibliography itself must be looked through.

SECTION A.—GEOLOGICAL INDEX.

GROUP 1—GENERAL.

(Papers referring to various formations.)

3 4 5 27 32 33 34 39 45 85 90 92 133 135
136 148 149 150 151 152 178 184 186 187 188 189 190 191
192 200 201 202 205 206 207 208 209 217 240 244 257 259
260 270 283 284 288 295 297 300 301 304 305 306 307 308
309 310 311 322 323 324 333 334 335 337 340 241 342 243
345 347 348 349 350 351 352 353 354 355 356 357 358 359
360 361 369 371 376 380 382 395 405 408 412 420 424 425
426 427 428 429 431 432 433 434 439 469 470 485 486 492
493 496 505 506 525 526 527 528 529 531 532 533 535 572
585 586 592 609 645 646 647 648 649 650 651 652 653 654
655 656 657 716 717 718 719 720 721 736 742

GROUP 2—PLIOCENE.

(Chiefly Wexford gravels.)

87 88 89 90 93 254 257 258 263 316 387 641 728 729

GROUP 3—GLACIATION, STRIÆ.

10 35 58 63 68 74 82 118 128 129 130 131 139 140
177 188 189 203 228 239 259 281 289 294 297 301 307 309
310 330 370 376 377 382 427 428 429 431 432 433 436 469
474 536 545 575 624 646 647 648 651 653 657 659 660 667
719 725 742 760

Group 4—Glacial Deposits, Erratics.

11 13 47 48 51 56 57 62 65 66 67 69 72 73
76 77 78 81 84 87 88 89 97 108 110 111 132 137
138 139 171 172 173 174 175 176 213 214 222 224 242 243
246 250 253 254 255 258 272 290 291 293 302 314 320 327
328 336 338 339 344 345 350 365 366 368 373 374 375 378
387 388 389 392 393 394 398 399 402 404 406 407 414 415
419 435 437 441 462 474 484 488 494 537 538 539 541 542
568 575 583 587 589 590 591 593 603 604 612 620 622 625
626 627 628 629 631 637 638 641 642 644 659 660 661 666
706 728 729 735 737 738 740 745 747 748 750 757 760 766

Group 5—Post-glacial in General.

31 389 399 440 487 544 569 570 576 588 621 635 734 751
756 766

Group 6—Submerged Peat, Bogs, Marl.

16 21 23 25 36 37 40 42 50 59 67 143 165 169
185 197 205 207 211 218 245 286 308 319 364 376 382 400
416 483 495 502 513 514 518 519 521 546 552 559 566 579
596 620 623 630 682 724 739 740 743 748 764

Group 7—Post-glacial Clays.

64 220 221 400 551 576 577 578 581 582 616 636 643

Group 8—Raised Beaches.

29 50 52 58 64 71 75 83 91 165 180 221 222 237
252 273 292 295 304 315 397 453 457 515 554 574 577 584
615 618 639 643 732 748

Group 9—Caves and Cave-Deposits.

2 7 8 9 12 15 19 20 28 55 79 101 102 103
105 106 107 109 120 142 145 147 149 152 155 198 199 202
231 256 267 296 371 376 438 510 511 524 525 551 562 563
564 565 601 602 607 608 645 665 670 671 673 674 676 678
679 680 687 688 689 726 727 732 733 742 754 755 756 757
758 759 761 762 763 765 766 767

Group 10—Vertebrate Fossils.

2 3 4 5 6 9 18 21 23 24 25 26 31 36
37 38 39 40 41 56 60 94 98 99 100 101 102 103
106 109 117 119 120 121 122 123 124 125 134 146 153 154
156 157 160 162 163 164 176 179 186 187 198 202 206 215
216 219 222 223 226 235 248 256 262 264 266 267 268 269
276 277 278 279 280 285 286 287 300 301 308 323 325 326
329 331 353 355 364 371 413 424 434 467 471 475 481 482
483 489 501 503 508 509 515 518 520 522 523 540 547 548
549 550 553 558 559 560 562 564 567 576 579 580 596 597
598 599 600 601 602 605 608 609 610 611 614 616 619 645
662 663 664 665 667 669 678 679 680 683 684 701 702 703
705 709 710 714 722 723 724 727 738 753

Group 11—Invertebrate Fossils.

31 33 47 85 86 87 88 89 90 91 92 93 104 110
111 132 144 169 197 205 207 210 220 221 222 243 252 260
263 295 297 304 308 312 313 314 316 317 318 365 367 376
382 437 486 487 493 500 535 537 538 572 576 577 578 583
584 591 612 615 622 623 626 628 629 636 637 639 641 642
643 647 652 660 664 666 699 700 734 735 737 738

Group 12—Prehistoric Settlements.
(Crannogs, kitchen-middens, sandhill sites, &c., and associated remains.)

1 17 22 30 63 95 115 116 141 166 167 168 170 193
196 225 230 234 261 265 271 274 275 282 332 363 372 376
379 381 384 385 396 421 423 427 442 444 446 447 448 450
455 456 459 460 464 465 466 468 476 477 478 489 490 491
497 504 507 514 516 517 519 530 555 556 557 566 594 595
632 645 658 668 670 671 672 675 677 681 682 685 686 690
691 692 693 694 695 697 698 704 705 707 712 715 730 731
732 744 749 752 766

Group 13—Prehistoric Implements, Utensils, &c.

29 42 46 48 49 52 53 54 58 59 61 64 65 80
96 112 113 114 126 156 158 159 161 180 181 183 185 194
195 212 227 229 231 232 233 235 236 237 238 273 441 443
445 449 452 453 454 457 458 461 462 463 473 479 489 512
534 561 562 618 633 639 643 667 678 679 680 698 701 702
708 711 713 732

Group 14—Denudation, Deposition, Formation of Sea-beaches and Lagoons.

14 205 319 351 383 390 391 397 398 401 403 408 409 410
411 417 418 422 427 429 574 640 739

Group 15—Elevation, Subsidence, Submergence.

70 127 177 247 303 416 472 546 606 617 634 635 672 677
681 740 741 743 746 748

Group 16—Climate of Past Epochs.

182 210 213 605

SECTION B—GEOGRAPHICAL INDEX.

1—General or Indefinite.

(Papers dealing with many localities, or with general considerations.)

3 4 5 6 10 11 18 22 26 27 34 36 37 39
41 85 88 90 92 94 95 99 100 108 114 116 118 119
122 129 140 143 153 154 156 157 162 163 164 168 177 182
193 195 210 213 214 217 218 222 223 227 230 231 232 238
240 241 242 244 246 249 250 253 255 264 266 268 269 281
283 284 285 287 288 290 291 292 293 294 296 297 303 318
320 321 323 324 329 332 333 361 362 364 366 367 368 370
373 374 378 383 385 386 387 388 389 390 391 392 393 394
395 397 399 401 404 405 406 407 409 413 415 419 420 422
439 443 446 447 448 452 453 454 457 458 459 460 461 463
466 467 472 474 479 480 481 482 493 494 498 499 501 503
508 513 520 523 534 535 537 538 542 547 548 549 553 558
569 571 573 574 581 582 586 587 588 589 590 594 596 599
600 605 606 607 609 610 611 613 617 622 625 634 635 638
656 659 660 661 662 664 673 674 675 676 682 693 697 708
709 710 711 713 714 723 724 725 730 732 739 743 745

2—Co. Antrim.

15 16 29 31 43 45 46 47 49 50 51 52 53 54
56 59 62 63 64 66 67 70 75 76 77 80 83 91
96 104 109 110 111 112 113 115 126 158 159 180 181 183
190 191 194 197 212 220 221 224 226 228 229 232 233 234
235 236 237 251 254 257 258 273 295 310 312 313 314 317
396 411 441 445 447 449 451 453 454 455 457 462 464 476
477 478 484 485 486 487 490 491 492 495 497 500 502 515
572 577 578 579 580 583 587 592 604 618 621 623 624 635
636 637 639 641 643 644 647 649 651 694 696 699 700 712
734 735 746 747 749 750 751 752 753

3—Co. Armagh.

150 151 186 187 188 189 194 251 257 525

4—Co. Carlow.

259 305 322 351 414 702

5—Co. Cavan.

248 251 261 469 470 504 509 522 653 658 691 715 717 719

6—Co. Clare.

199 202 205 206 353 371 376 424 426 434 438 530 705 706
758 765

7—Co. Cork.

1 7 13 17 30 105 140 141 142 145 147 152 175 262
265 319 327 328 336 338 340 344 349 350 352 355 357 358
430 575 620 670 726 727 739 740 741 761

8—Co. Donegal.

44 192 239 251 270 271 272 306 307 309 416 417 421 423
433 440 465 496 497 519 557 584 616 648 704 718

9—Co. Down.

14 23 45 48 57 60 61 65 68 69 71 72 73 74
78 81 82 165 166 169 183 186 197 229 232 251 275 301
310 311 398 450 473 475 485 486 487 554 555 556 576 578
585 592 633 635 636 637 666 667 703 734 748

10—Co. Dublin.

32 33 121 124 128 132 133 136 137 138 139 171 173 174
216 260 290 298 299 300 304 337 342 365 437 518 540 543
544 567 568 591 593 612 615 622 626 627 629 722 723 724
756

11—Co. Fermanagh.

42 55 79 150 151 161 251 277 278 279 562 563 564 565
566 648 653 684 685 686 687 688 689 690 692 693 695 717
719 720 721

12—Co. Galway.

97 202 207 208 251 330 371 372 376 377 379 380 381 382
384 402 427 428 429 431 432 468 532 545 546 559 657 760
764

13—Co. Kerry.

12 35 131 143 172 175 201 211 289 328 335 336 339 341
346 347 349 352 359 425 426 603 744 761

14—Co. Kildare.

173 174 184 300 343 348 351

15—Co. Kilkenny.

134 178 198 200 209 256 267 286 322 334 351 489 510 551
560 601 602 665 698 754 755 762

16—King's Co.

170 184 208 245 343 356 507 532 632 736

17—Co. Leitrim.

149 251 369 469 470 653 712 717 742

18—Co. Limerick.

21 25 40 98 121 123 125 146 160 215 219 280 344 349
353 354 355 424 425 426 430 434 483 550 597 598 701 702

19—Co. Londonderry.

86 135 176 189 190 191 196 247 251 272 274 315 433 440
442 444 446 448 449 456 488 527 528 529 572 578 595 616
624 637 642 649 734

20—Co. Longford.

40 148 203 204 208 251 325 326 331 431 470 712

21—Co. Louth.

58 138 251 304 308 525 570

22—Co. Mayo.

97 149 242 243 251 428 431 432 505 645 646 650 652 654
655 666 716 760

23—Co. Meath.

144 148 171 173 174 179 184 251 304 308 337 470 614 669
683 684 707 731

24—Co. Monaghan.

150 151 188 248 251 308 471 509 516 517 522 525 719

25—Queen's Co.

170 200 276 343 348 351 356 375 531 532 668 736

26—Co. Roscommon.

149 207 208 251 363 431 469 470 716

27—Co. Sligo.

149 242 251 369 608 650 654 737 738 742 759 766

28—Co. Tipperary.

19 20 24 28 178 200 209 334 344 345 353 354 356 358
360 376 434 511 524 532 533 668 682 733 736 755 767

29—Co. Tyrone.

151 167 189 192 251 257 417 433 521 526 527 528 561 663
718 720 721

30—Co. Waterford.

2 7 8 9 101 102 103 106 107 120 127 155 178 252
282 345 357 358 619 671 672 677 678 679 680 681 763

31—Co. Westmeath.

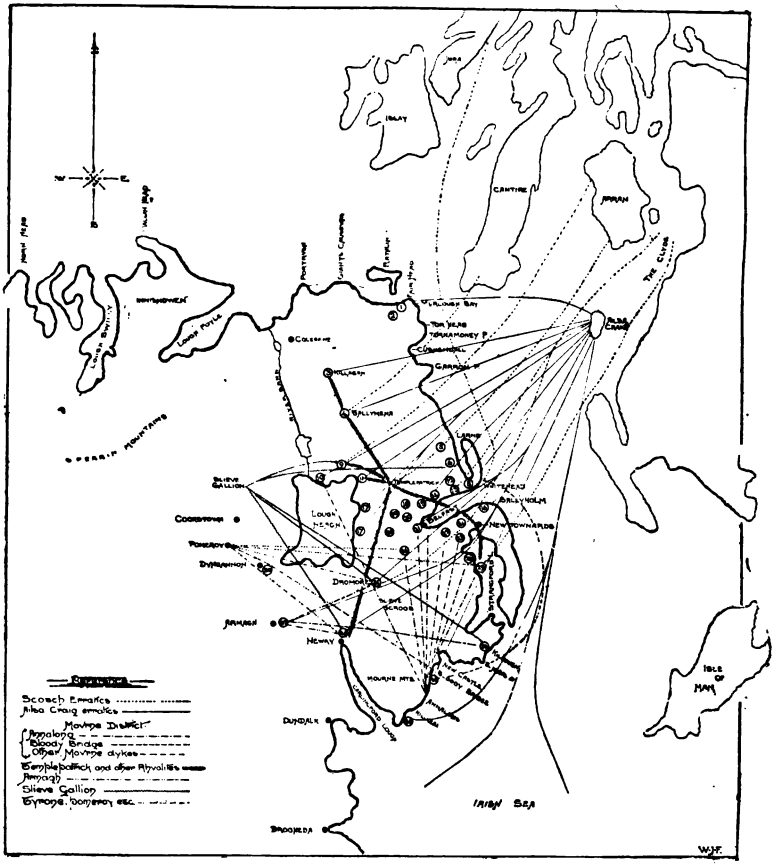
38 148 184 185 208 225 251 630 631

32—Co. Wexford.

87 88 89 90 178 259 263 305 316 322 400 403 408 409
412 414 552 728 729

33—Co. Wicklow.

33 128 137 139 259 300 302 305 342 409 410 418 435 436
506 512 514 536 539 541 591 593 622 628 640



N.-E. IRELAND.

SHOWING DISTRIBUTION OF ERRATICS.

A SUMMARY

OF

RECENT GLACIAL INVESTIGATIONS

BY THE

BELFAST NATURALISTS' FIELD CLUB.

COMPILED BY

MADAME RODOLPHE CHRISTEN

(MISS SYDNEY M. THOMPSON).

Being an Appendix (No. 7 of Vol. II.) to the Proceedings of the Belfast Naturalists' Field Club, for 1905-6.

APPENDIX.

SUMMARY OF RECENT GLACIAL INVESTIGATIONS BY THE BELFAST NATURALISTS' FIELD CLUB.

COMPILED BY MADAME RODOLPHE CHRISTEN (MISS SYDNEY M. THOMPSON).

Fully a dozen years have elapsed since a circular was sent to our Club by Mr. Percy F. Kendall, M.Sc., Secretary of the British Association Erratic Blocks Committee, requesting the Club to co-operate by examining the glacial phenomena of our district, with especial reference to the distribution of erratics in the drift. A ready response was given by the Club, and a geological section formed for the express purpose of conducting the inquiries, and a collection of Irish rocks commenced, to assist in identifying the parent locality from which the erratics had travelled, specimens of Scotch rocks likely to occur being presented by Mr. Kendall. A room was acquired at the Museum where meetings could be held and collections and instruments stored. The patient accumulation of a multitude of details on many points was willingly undertaken by many members of the Club, as well as by the little group specially appointed; and erratics from outlying districts were received from time to time, invaluable assistance being also given by Mr. S. A. Stewart, A.L.S., F.B.S.E., and Mr. Joseph Wright, F.G.S., whose works on the Mollusca[1] and Microzoa[2] of our boulder clays rank amongst the classics of British glacial literature.

1. Mollusca of the Boulder clay of the N.E. of Ireland. Proc. B.N.F.C. (2) I. Appendix for 1879-80, p. 165.

2. Post-tertiary Foraminifera of the N.E. of Ireland. Proc. B.N.F.C. (2) I. 1879-80, p. 428.

The work was commenced on the 12th of August, 1893, when Miss Mary K. Andrews, Mr. Stewart, and the writer visited a fine section of boulder clay 25 feet in depth, exposed (in making subway) at Greenisland Railway Station. A short description of the work may be of interest, as all subsequent examinations were similarly conducted, sometimes by solitary workers, sometimes by the whole geological section, but usually by two or three members, amongst whom I must gratefully single out Miss Andrews and Mr. Robert Bell, whose unwearying toil made this summary a possibility.

Boulder clay usually contains innumerable stones of all sizes embedded irregularly throughout its mass. Of these 100 or more stones were selected at random, broken and counted to give the percentage of erratics, an erratic being defined as "any stone found in a glacial deposit that is not resting on its parent rock, no matter how short a distance it may have travelled." The subjacent rock at Greenisland being Trias, every stone not of Triassic origin was an erratic, and it was surprising and interesting to note what a varied assortment occurred, varying in size from chalk boulders, five feet long, down to tiny pebbles of far-travelled rocks from Scotland, Ailsa Craig, North Antrim, Derry, and Tyrone, and large, beautifully-scored, and polished blocks of Silurian slate, hailing from either Scotland or the County Down. Shells were looked for, and bags of the clay collected to be submitted to Mr. Wright for microscopical examination. This is the most troublesome and tedious process connected with our researches, involving hours of monotonous labour on Mr. Wright's part, with only occasional assistance from Miss Smythe, as sometimes several pounds of stiff clay when washed, dried, and floated, yield one tiny foraminifer too small to be visible to the naked eye!

Fossils found in the clays were carefully collected, and photographs of the section taken by Miss Andrews for future reference. Specimens of well-known rocks were listed in the field, other fragments being brought to the Museum to be numbered, mounted, labelled, and submitted to Mr. Stewart, Mr. J. St. J. Phillips, A.R.I.B.A., or Mr. Seymour to ascertain their

place of origin. Unknown erratics were from time to time forwarded to Dublin to Mr. A. M'Henry, M.R.I.A., of the Geological Survey of Ireland, whose unrivalled acquaintance with Irish rocks was always generously placed at our service; to Professor Grenville A. J. Cole, M.R.I.A., F.G.S. (to whose warm sympathy and kindly help our geological section owes so much), to Professor W. W. Watts, F.R.S., and others, whose special knowledge made them able to identify the rarer erratics, and I gladly acknowledge the great assistance thus kindly given. Immense aid was also obtained from the fine Bibliography of Irish Glacial Geology[3] expressly compiled for this purpose by Mr. R. Lloyd Praeger, B.E., M.R.I.A.

We have more than a hundred different erratics in our Club collection; 11 of these are unquestionably Scotch, 10 others may be of Scotch or Northern Irish origin, the remaining 86 being Irish. An erratic of Ballachulish slate is our most northerly specimen, others from the Clyde Area, Cantyre, and fragments of fossiliferous Silurian rocks from Girvan carry us southward to Ailsa Craig, whose unique riebeckite rock is so widely distributed in our boulder clays. Passing to Ireland, we find fragments from the primary rocks of North Antrim, Derry, and Tyrone, others from Cultra, Castle Espie, the Coasts of Down, and from Armagh, joining the icy procession until we reach in the pretty pink eurite found near Annalong our most southerly parent rock.

A remarkable change has come over geological thought with regard to the glacial period in the dozen years that have elapsed since our section commenced its work; gradually the controversy as to the origin of our drifts has died away, as the conception of a vast ice sheet from various confluent sources moving over our islands, grinding solid rocks, picking up and transporting fragments of every material met in its progress, transforming the surface of the country by erosion and deposition, became widely accepted. The issues to be studied were

3. A Bibliography of Irish Glacial and Post-glacial Geology. By R. Lloyd Praeger, B.E., B.N.F.C. Proc. 1895-6.

also vastly simplified, resolving themselves chiefly into the transport of erratics as indications of the directions of ice-flows; the presence or absence of marine organisms remaining an important factor in differentiating between ice-sheets of inland and transmarine origin.

Let us pass in imagination backwards over an unknown but vast number of centuries to a period when Arctic conditions prevailed over Northern Europe, and mighty confluent fields of ice slowly travelled onward, traversing the North Channel, the Clyde, and the Irish Sea, grinding out deep troughs in the sea floor where such an obstacle as Rathlin Island obstructed the lower layers, enveloping it, Ailsa Craig, and the Isle of Man, overflowing eastward into England, and entering Ireland westward over the noble promontory of Fair Head, the first in our list of localities recorded in this summary.

The iceworn summit of Fair Head is strewn with erratics from many points of the compass, and strolling further south we observe many large blocks resting on the cliffs that encircle Murlough Bay. Noticing one of schist we ponder on its origin. Was it torn from a bed of similar rock on the shore many hundred feet below, or was it borne on ice 20 miles across the sea from similar rocks in Cantyre, whose fragments are scattered over Rathlin? Glancing at the tiny handful of pebbles gathered at random over Fair Head, which include a small, rounded fragment of Ailsa Craig, which lies due east, one from a point near Torr Head to the S.E., a bit of chert, old red conglomerate, and a peculiar smooth-looking green felsite from Scotland or North Antrim, we see the significance of studying the distribution of erratics and the important deductions to be drawn from their presence on these Ballycastle headlands

Our summary includes 36 localities, and we will follow the course of the intrusive ice southwards, first considering the distribution of erratics from Ailsa Craig which are much worn, indicating severe ice action, even some specimens dredged by Mr. Welch 40 fathoms deep off Rathlin were ground completely smooth. It occurred at 26 out of our 36 localities, has been found round our shores by Mr. Welch at Portrush in sandhills,

by Miss Andrews at Portstewart and at Kilkeel, by Mr. H. J. Seymour, F.G.S., away down at Waterford and Youghal, and by Messrs. W. B. Wright, B.A., and H. B. Muff, B.A., F.G.S., at Whiting Bay and other Cork localities.[4]

Its absence from 10 of our localities is worth analysing, as in some cases this seems to tally with other circumstances suggesting a special period for these deposits. Although none was found at No. II., a drift-filled valley on Fair Head, fragments occur as loose drift half a mile away. Gleno, VI., Cave Hill, XV., and Divis, XIX., are small deposits of very local rocks; Wolfhill, XVIII., and Dungannon, XXX., have not been fully investigated, and Killough, XXXIII., and Bloody Bridge, XXXV., have special features suggesting that they may be the product of later local glaciations. Although none was found in Castle Espie, XXVIII., boulder clay, fragments are frequent as loose erratics on the shore of Strangford Lough, XXIX., and Mr. J. O. Campbell found an isolated morsel on Spinkwee mountain in the Mourne range. In spite of careful search, Mr. Bell never found any west of the Bann until this year, when he picked up a solitary piece on the shore of Lough Neagh, near Moyola River.

Passing southward to No. III., the esker ridges about Killagan and Glarryford, we have another very important sign of an unsuspected iceflow to the N.N.W., in the frequent occurrence of Templepatrick rhyolite, the latter place lying some five and twenty miles S.S.E. We found rhyolites also at Ballymena, IV., near Cookstown Junction, IX., in boulder clay at Macedon, on the western shores of Strangford Lough, and away down at Newry, XXXIV.

Turning for a moment from the rhyolite fragments in Killagan eskers, let us read an extract from Mr. Maxwell Close's

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4. See Geology of Cork and Cork Harbour, Drift Memoir. Geol. Surv., 1905, p. 105, etc.

Also Proc. Roy. Dub. Soc., Vol. X., Part 2, p. 269 (1904). Pre-Glacial Raised Beach. W. B. Wright, B.A., and H. B. Muff, B.A., F.G.S.

famous paper on the Glaciation of Ireland,[5] dealing with that neighbourhood:—"About 3½ miles from Ballymoney, on the new road to Coleraine, at Seccaun Quarry, smoothings and striations, N.W. by W., were found by me on basalt. It was impossible to say in which direction the grinding agent moved along the lines. . . . Near Cullybackey at the distance of about ¾ of a mile on the road to Ballyconnelly Cross-roads, striations may be seen at a basalt quarry, N.N.W. Also on the same rock at the very cross-roads, 1½ mile S.W. of Cullybacky —a good example. These are parallel to the others, but it must be confessed they rather look as if the grinding movement were towards the N.N.W. This, however, I suppose, must be impossible." Writing to Mr. Close some three years ago, I mentioned our discovering rhyolites at Ballymena and Killagan, to which he replied:—"I am interested and pleased to know what you tell me of the northward movement of fragments of Templepatrick rhyolite, which confirms my reading of those striations to which you refer." This is the second time that our glacial researches have proved the remarkable acuteness of Mr. Close's reading of glacial striæ.[6]

Passing Ballymena, IV., we reach at Kilwaughter, V., and Gleno, VI., our only two localities where drift rests directly upon chalk, the former at an altitude of 500 feet, yielding only 3 Ailsa and 2 Bauxite erratics amongst a crowd of dolerite, basalt, and cretaceous fragments. Gleno at 300 feet being a totally different deposit, crowded at its base with Liassic fragments, its upper portion stratified, with unusually angular stones. Probably the basalt along this easterly coast has been stripped off the chalk by the impact of ice, as well as over Islandmagee, where magnificently glaciated surfaces of limestone are sometimes exposed in the quarry opposite Magheramorne ferry, and our members are familiar with the ice-ground

5. Notes on the General Glaciation of Ireland. By the Rev. Maxwell Close. Journ. Roy. Geol. Soc. Irel., Vol. I., Part 3, p. 215.
6. Note on "Glacial Geology of Kerry," by Miss Sydney M. Thompson. The Irish Naturalist, Vol. VIII., No. 3, p. 61, 1899.

layers of basalt capped by boulder clay in the less-exposed face of the great Magheramorne Quarry.

At Cloughfin, immediately north of Black Head, we have boulder clay resting on Trias about 50 feet above the open sea, and, as might be expected, we have a very varied series of erratics, including slate from Ballachulish, felsite from the Clyde, Cushendun, and Torr rocks, Ailsa rock, syenite from Slieve Gallion, ironstone nodules from Lough Neagh, granite from Slieve Croob, and three fragments of the porphyry dyke at Bloody Bridge, near Newcastle, nearly 50 miles south of Cloughfin.

Just inside the mouth of Belfast Lough, near Whitehead, we find an interesting difference in the list of erratics at Cloghanport; this deposit is only 4 or 5 miles from Cloughfin, but is much more limited in range. No rocks from south or west occur, Ailsa, Torr Head, and Cushendun furnishing the most distant boulders. Amongst the 339 erratics listed, 24 were from Ailsa Craig. We may group Ballyholme, near Bangor, with these two seaside localities, and note abundant pebbles of Ailsa and eight undoubtedly Scotch rocks, including a Silurian shale from Girvan, containing a fossil trilobite.

Retracing our steps inland to a group about Lough Neagh, with Drumsough IX. (near Cookstown Junction) and Cranfield Point, X., on its north, the glacial gravels of Antrim, XI., and Glenavy and Crumlin, XVII., on its eastern shore, we still find erratics from Cantyre, the Clyde, Cushendun, and Slieve Gallion, adding granites from Pomeroy in Co. Tyrone, as we descend eastward to Woodburn Glens, XII., anl arrive at Greenisland, where our survey first commenced its labours with such a surprising list of travelled rocks.

Once more we ascend the basaltic plateau, searching, at Mr. Wright's request, for the highest attainable boulder clays, visiting the great quarry behind Carnmoney Church, and extracting with difficulty the boulders unusually firmly bedded in the clay. Here we came upon chert, carboniferous limestones, and shales that have probably travelled 40 miles across the plateau from the Ballycastle coal-

fields. Subsequently we ascended the Cave Hill, and found a small deposit in the hollow behind M'Art's Fort, more than a thousand feet above the sea, containing erratics of flint and several foraminifera, but the loftiest record fell to Mr. Stewart, who discovered fossiliferous boulder clay between 1,300 and 1,400 feet on Divis Mountain![7]

In the recent geological survey memoir of the drifts around Belfast, published in 1904, we are told of Lake Belfast,[8] a vast expanse of fresh water, formed during the waning of the glacial period by flood waters from melting ice in the Lagan Valley, dammed back by a barrier of ice that still existed across the head of our present Lough. The waters of this lake escaped by the Dundonald Valley, emptying themselves into Strangford Lough. The gravel pit at Longhurst, XXVI., Neill's Hill, XXII., Morrison's Sandpit, XXIII., and other deposits of Dundonald Valley, XXIV., all belong to this late glacial period. Possibly these southerly floods bore along much floating ice, which may partially explain the occurrence of many rocks from the Mourne districts in the Belfast drifts, in the Dundonald sands and gravels, and along the wave-worn boulder clays of Strangford Lough, where they are mingled with granites from Pomeroy, Slieve Gallion, and Slieve Croob, rhyolite from Tardree and eurite from Annalong, one unique specimen embedded in boulder clay at Castle Espie, XXVIII., being identified by Mr. M'Henry as a primary conglomerate occurring in Cavan, Monaghan, and Armagh. We found Castle Espie limestone as an erratic southward as far as Killough, where our geological section held a pleasant Christmastide excursion in 1897. This Killough deposit of stiff boulder clay and conglomerate, partially turned to calcrete, occurs close to Silurian rocks, whose splendid glaciation disappears below the waves; yet no microzoa were found in the clay from this section, although the spray is

7. The Occurrence of Boulder Clay on Divis. Proc. B.N.F.C. (2), IV., p. 215 (1894-5).

8. The Geology of the Country Around Belfast. Mem. Geol. Surv. Irel. (1904), pp. 50, 62, etc

actually beating upon its face. Is it, perhaps, the deposit of more recent inland glaciers during the waning of the "West British ice," believed by Mr. Lamplugh to have reached its maximum earlier, and to have shrunk more rapidly than the Hibernian ice? Loose erratics at the foot of these clay cliffs included carboniferous limestone from Armagh, which lies almost due west, with sundry rocks from Slieve Croob and Slieve Gallion, confirming Mr. Close's observation of N.W. by westerly glacial movements in the Comber and Killyleagh districts. The geological survey memoir just alluded to mentions certain striæ running east and west in this district,[9] although the chief grinding movement seems to have been from N.N.W. to S.S.E. Mr. Kilroe believes these E. and W. striæ to denote an earlier ice movement from the east, but the absence of microza in Killough section seems to me almost a conclusive proof that it was not deposited by transmarine ice.

I referred before to the importance of examining drift deposits for marine organisms, and microzoa formed our chief reliance owing to the remarkable scarcity of shells in our N.E. drifts; they only occurred sparsely at 9 of our 36 localities. I once visited the celebrated glacial cliffs of Killiney, near Dublin, with Mr. Praeger, and easily collected more shell fragments in an hour than in seven years work round Belfast; a useful warning against conclusions drawn only from a single district.

The presence of stones bored by marine plants or animals is another test used to distinguish submarine deposits. Of these we only found two, one at Cloghanport and one at Greenisland.

The relative proportion of underlying rocks and erratics was another point recorded. Glacialists are well aware that in many drift deposits none of the subjacent rock occurs, although it may be found further on in the line of movement; also that in Eskers, which usually rest on boulder clay (frequently passing imperceptibly into it at their upper ends) erratics are usually carried further afield than in those contained in the boulder

9. Opus cit., p. 97.

clays upon which the Esker rests. Hence the value of these records. At Greenisland we counted 300 boulders, each 100 taken at random from a different level in the section: *all* were erratics, and the proportion in which they occured varied in a definite ratio for each level—100 at Castle Espie, similarly proved to be all erratic boulders. In the Black Mountain deposit, discovered by Mr. Bell, the only place I have seen in our district with distinct upper and lower boulder clays (the latter being so hard that hammer and chisel were required to extract its stones), 270 out of 274 were erratics; at Cloghanport 331 out of 339, with percentages at other localities varying down to 17 per cent. at Carnmoney and Bloody Bridge, XXXV. The latter has been considered a moraine deposit, and contained only a few travelled rocks, including a fragment of the porphyry dyke on the shore, 100 feet beneath, but no chalk nor flints were found in it.

Another point noted in our schedules is the frequent occurrence of some erratics and rarity of others. Of 107 varieties we found 26 at Dromore, XXXI., 27 at Ballyholme, 28 at Cloughfin, 33 at Newry, and 44 different rocks—almost 40 per cent. of the total list of rock varieties in the brickfields round Belfast, 10 out of 44 being isolated records of erratics, not as yet found elsewhere, showing the value of patient, persistent investigation, such as Mr. Bell devoted to them. Glacialists who may wish to study the matter more fully are referred to the tables accompanying this summary, and can examine our valuable list and collection of erratics at the Museum and the manuscript schedules with detailed descriptions of localities investigated.

When commencing work, we were frequently assured that we would never find erratics north of their place of origin. Our experience does not at all bear out this assertion, which postulates a simple, southward ice-flow, and omits to reckon with radiating local systems of glaciation that may have persisted over high ground prior to, and long after, the great central plain of Ireland and the Irish Sea were free from solid ice. A scrutiny of the tables giving the compass direction of

parent localities of definitely-recognised erratics shows a surprisingly frequent mixture of southern rocks, even in our most northerly districts.

In the drift memoir already referred to (p. 87) Mr. W. B. Wright suggests that our records of Mourne granite may be really due to the presence of a closely similar Arran rock found by him in drift on the basaltic plateau. Our Mourne erratics, however, include various dykes identified by Mr. M'Henry as Tertiary intrusions in the Mourne range, one of the most distinctive being a pink eurite which he locates near Annalong. This we found in many brickfields round Belfast, in several places in Dundonald Valley, and on the shores of Strangford Lough. Our S.S.W. record is a large composite block of grit and Slieve Croob granite, weighing about 9 tons, discovered by Miss Andrews and Mr. Stewart on Rough Island, near the northern extremity of Strangford Lough, 18 miles distant from its home.

In connection with this question of drift from the south, which suggests a gradual amelioration of the local climate, I must not omit referring to an ox skull and vertebra and fragments of wood found by Mr. Bell in apparently undisturbed boulder clay at Springfield brickyard in 1895, an inch and half of horn protruded from the clay seven feet below the surface. The fragments were submitted to Professor Haddon, F.R.S., and Mr. E. T. Newton, of Jermyn Street Museum.[10] Mr. Stewart and I subsequently visited the spot with Mr. Bell, and collected a bag of clay from the point where the bones were found, which was examined by Mr. Wright, but did not yield any marine organisms. When we recall the faunal conditions of Arctic regions in the present day, where the ice age still prevails, there seems no inherent impossibility in the coeval existence of animal life and many local icefields. Mr. Maxwell Close, Professor King, and many other geologists believed that the West of Ireland was relatively higher during the glacial

10. Proc. B.N.F.C. Report of Geol. Section. Miss Sydney M. Thompson (1895-6), p. 304.

period than at present, and its western shores conterminous with the 200-fathom line of sounding—a belief sanctioned by recent dredgings off our western coast on a muddy plateau, on whose margin rest many Donegal boulders close to the edge of the Atlantic abyss. A post-glacial elevation followed, indicated by the submerged peat round our shores, while glacial striæ and even eskers disappear beneath the waves of to-day. May we imagine these traces of land-ice and land-bogs to be contemporaneous during that post-glacial elevation, which some geologists consider was sufficiently great to connect Ireland with England, and permitted the re-peopling of our island by animals from the less severely glaciated sister land?

In compiling this summary of the Club's recent glacial work, I have felt strongly the lack of more thorough familiarity with similar work in other countries than is possible for those residing at a distance from great scientific libraries. When our work commenced in 1893, Ailsa erratics had been found for the first time in Ireland by Professor Cole, and we can still recall the warm interest excited by our first schedule handed in at the British Association meeting at Oxford in 1894, when its frequent occurrence in our drifts was mentioned. Ours was the first report ever received from Ireland by that Committee during its existence of fully 20 years. Our Club's Annual Proceedings have also furnished the Geological Survey with many useful data for their drift memoir, showing the value of careful local records, and the patient accumulation of details only possible to residents in a locality. The corresponding assistance rendered to local workers by such a memoir, which correlates our own observations with a wide experience of drift deposits in other parts of our islands is also inestimable.

We have proved the ubiquitousness of Ailsa rock, and the frequent occurrence of other Scotch erratics, whose presence at Belfast was noted by Messrs. Bryce and Hyndman in 1843.[11] We have established the unexpected occurrence of rocks many miles north of their parent locality, and traced many trains of

11. Report on the Geology of Londonderry, Tyrone, and Fermanagh. By J. E. Portlock, F.R.S. Appendix, p. 738.

erratics across the land; but some field work is still needed to connect distant records with our own neighbourhood.

Let us compare the north-westerly occurrence of Templepatrick rhyolite (see *ante*, p. 324) and frequent chalk and flint from Malin to Inishowen Head, recorded by Mr. Close and Mr. Harte,[12] in conjunction with evidences of an ice-movement northwards of Inishowen Peninsula. Professor Carvill Lewis, when visiting Ireland in 1885 to compare British with American glaciation, wrote[13]:—"My ideas concerning glaciation have now been completely revolutionised. I came to Ireland, expecting to find it glaciated from the north. I find instead a complicated system of ice streams. A Scotch sheet invaded the eastern corner of Ireland, going down to Belfast. The ice-sheet of the interior radiated off in all directions." Again, when driving from Buncrana towards Malin, he describes "evidences of a great stream of ice moving north and east out of this valley. Slieve Snaght and the adjoining hills, together with this watershed, formed a great snowfield. Did the whole ice-sheet of Ireland move out on this watershed, or did it only drain a local snowfield? The watershed is 500 feet high." Mr. Close's N.N.W. ice-stream was moving to meet this one at Malin on the other side of the same watershed. Coupling these facts with the rarity of Ailsa rock west of the Bann and the proximity of the great Sperrin range of mountains, where Mr. Kilroe has recorded evidence of a glacial movement south-eastward,[14] seems to suggest a Sperrin ice-stream meeting the Scottish ice and a lobe diverging N.-west, bearing rhyolites and Ailsa with it. To ascertain the truth of this purely speculative hypothesis by investigating deposits between Killagan and Malin Head should be a fascinating bit of work. Although the main mass of the intruding ice moved southward, pressing on the Mourne mountains as it received fresh streams from the heights to the west of

12. On the Post-Tertiary Geology of Co. Donegal. By William Harte. Journ. Roy. Geol. Soc. Ireland, II., 30-67 (read 1867), 1871.
13. Glacial Geology of Great Britain and Ireland. By the late Henry Carvill Lewis, M.A., F.G.S. Longmans, Green & Co. (1894), p. 118.
14. Directions of Iceflow in the North of Ireland. T.I.G.S., XLIV., 827-833 (1888).

Lough Neagh, passing down the centre of Ireland, sending off side-currents into Carlingford Bay and north of Howth on its way, a minor stream probably reached Galway as suggested in Mr. Kilroe's paper, a supposition interestingly supported by the discovery by Mr. J. O. Campbell during our Club's visit in 1896 of an Antrim flint on one of the Aran Islands in Galway Bay. Mr. Kilroe informs me that Antrim flints have a good distribution westward, and he recently found one in coarse sandy alluvium in Co. Limerick, which must have travelled west in ice and down the Shannon valley, probably in river drift. In response to my mention of the N.N.W. rhyolite erratics he writes:—"All I have seen of the drifts since my original paper on the Ulster ice-flow has confirmed me in the opinion that there must have been an overwhelming flow . . . from Scotland over Ulster, and that this was followed by a flow northward and southward from Hall's axis of Irish distribution —perhaps N. by W. in Antrim, northward through Co. Derry, and N.N.E. through Donegal. I should not say that this northerly flow or any part of it constituted part of the overwhelming Scottish ice, though materials carried westward by the latter may have been subsequently carried northward and southward from the region indicated by Hall, extending from South Antrim to Galway." Our own observations incline me to question whether the Scottish ice swept westward over Donegal as Mr. Kilroe indicates, but these points are purely personal speculations to be refuted or confirmed by further investigation.

In conclusion I cannot speak too warmly of the fascination of erratic-hunting, and the triumphant joy of bringing home a handful of unfamiliar fragments; of many pleasant days spent in the open-air along the shore or on breezy hillsides, till the icefields of the past became living realities to us, and we almost seemed to share in their irresistible onward movement. Neither can I conclude without a grateful reference to the many undying friendships cemented by mutual tastes and mutual toil and study that will ever cluster round the memory of our pleasant Field Club Excursions!

THE CARNMONEY CHALCEDONY:

ITS OCCURRENCE AND ORIGIN.

(With a General Note on the Formation of "Secondary' Siliceous Minerals in Volcanic Lavas).

By JAMES STRACHAN.

Being an Appendix (No. 8 of Vol. II.) to the Proceedings of the Belfast Naturalists' Field Club, for 1905-6.

THE CARNMONEY CHALCEDONY, ITS OCCURRENCE AND ORIGIN, (WITH A GENERAL NOTE ON THE FORMATION OF "SECONDARY" SILICEOUS MINERALS IN VOLCANIC LAVAS).

BY JAMES STRACHAN.

1. Carnmoney Hill, with its steep escarpment sloping sharply towards the Belfast Lough, is a prominent and picturesque feature in the landscape of the country lying to the North of Belfast. The attention of the geologist is attracted both by the peculiar shape and the comparatively isolated position of this Hill, which represents the site of an ancient volcano, from whose throat, in Tertiary times, poured forth part of the Upper Basaltic Lava. On the south side of the hill, the denuded 'neck' or 'plug' of this old volcano may be traced, cutting through the Lower Basalt, the Cretaceous, and older strata. The Upper Basalt and part of the Lower have been removed by denudation, leaving the plugged-up vent, which is almost one quarter of a mile in diameter. The material of the neck is a vesicular lava similar in appearance to that of the doleritic dykes found in various parts of Co. Antrim. In a recent Survey Memoir, the following petrological analysis of this rock is given:—"Under the microscope the rock is a fairly coarsely crystalline dolerite, containing much magnetite in the form of opaque, black, and unaltered crystals. The chief constituents are pale brownish augites and fresh plagioclase laths (labradorite) intergrown ophitically with one another. There occurs also here and there in the sections a more compact or finely crystalline material of similar composition, but with a large proportion of glass. It is chiefly in this part that the mineral 'hullite' occurs as a brownish or greenish-brown translucent substance, somewhat like palagonite in appearance,

and more or less completely filling irregularly-shaped vesicles in the rock. The central greenish (chloritic) part is usually almost isotropic, and is surrounded by a zone of yellowish-brown material, with a fibrous structure and a radial arrangement of the component parts."

Professor Hull remarked that olivine was also present in the rock, but according to Professor Cole it is by no means an abundant constituent of the mass. There is no doubt, however, I think, that in some places the rock approaches the nature of an olivine-dolerite, and, that in such portions of the lava, zeolitic minerals are of more common occurrence than purely siliceous ones. To this analysis must also be added *iron pyrites*, which appears to be distributed in a very irregular fashion throughout the rock. On the whole, it is not a common constituent, but occasional fragments of the rock may be found containing at least five per cent. of the bright, brass-yellow crystals. In the main, we may freely accept Professor Cole's description and nomenclature of the rock as a basaltic-andesite, or allied to the pyroxene-andesites. Although coarser in crystalline structure, the basaltic-andesite of Carnmoney is nearly related to many of the Scottish andesites, which are compact rocks made up chiefly of labradorite, with a smaller proportion of augite, and without olivine; from these lavas are obtained the finest of the chalcedonies, known as 'Scotch pebbles.'

2. The Chalcedony of Carnmoney occurs in large cracks, or veins, in the rock. These are sometimes as much as twelve inches in width, and from this, the cavities thin away into a mere hair's-breadth. These veins have apparently been formed during the consolidation of the lava, for the vein-sides are coated, in all degrees of thickness from a mere film to one inch, with the mineral *hullite*, which has been described by Professor Cole as "the altered and hydrated glass of the original basaltic ground-mass." As the hot magma hardened, the cooling and crystallisation of the minerals caused mechanical contraction to take place, resulting in the formation of large cracks into which

the still fluent portion of the lava was secreted, coating the walls of such cavities with 'hullite.' This mineral must now be considered for a little, because its presence plays an important part in the structural arrangement of the Chalcedony, and perhaps in the deposition of the silica in that form. Hullite is a black pitch or waxy-like substance, passing in colour to yellow-brown and red-brown. It is soft (H—2 to 3) and extremely brittle, breaking with a smooth, slightly conchoidal fracture. In thin sections the black specimens show a greenish colour, but a good deal of the hullite in the cavities and veins is more yellowish-brown and reddish-brown in colour. This mineral has been described as mammillated and 'minutely stalactitic,' but 'minutely reniform' or 'minutely spherical' would be a better description, because the 'stalactites' of hullite, like those of chalcedony, have a fibrous structure, and seem to be 'animated by a kind of crystalline spinal energy.' Very rarely these spherical forms are slightly translucent, and by reflected light appear to glow with a fiery amber colour. The thicker deposits of hullite, coating the sides of the veins in which the chalcedony occurs, are often cracked and fractured, representing on a minute scale the larger cracks or veins of the mother-rock. These small cracks are filled up in the same fashion as the large veins, with chalcedony and other minerals. In chemical composition hullite varies, but it might be described as a basic mineral, composed of aluminium, iron, magnesium, and calcium silicates, containing about 39 per cent. of silica, and about 13 per cent. of 'water of hydration.' It has been placed mineralogically as 'near delessite,' but might be said to occupy a position between celadonite and chlorophæite, so far as chemical composition is concerned. All of these minerals, however, vary in their composition, and by some mineralogists are not regarded as definite species. The old-fashioned name of 'green earth' seems to be the best title for minerals of this class, although several are not 'green,' and a number not 'earthy.' Fifteen years previous to Professor Cole's investigation of hullite, the latter was carefully examined, for the first time, by E. T. Hardman and Professor Hull. Hardman came to the conclusion

that it was a secondary mineral, and classed it as a member of the chlorito-ferruginous group or green earths. As far back as the year 1837, however, Dr. Scouler described it as a 'pitch-stone,' or volcanic glass, and in 1843 General Portlock called it an 'obsidian.' It is of interest to trace the history of geological opinion concerning hullite from these earliest references to those of the present day. In the years 1837-1843, it was regarded as a volcanic glass, which had been exuded into the cavities as the lava cooled. About the year 1868 this opinion was upheld by G. V. du Noyer, but ten years later Hardman departed entirely from this view, as we have already stated, describing it as a secondary mineral of the green earth variety. In 1879, as Professor Cole has pointed out, Dr. Heddle, of St. Andrew's, supported Hardman in his claim for the retention of hullite as a definite mineral species. It is here worthy of notice, that Heddle's views concerning the *origin* of such 'green earths' underwent a complete change; in 1871 he regarded such minerals as contemporaneous with the last stages of cooling in the early history of the lavas in which they are found, whereas in his "Mineralogy of Scotland," written at a much later date, he describes the same minerals as decomposition products of the weathering lava. In the same year (1879) William Gault, of Belfast, took up this idea, that hullite was a 'secondary' mineral, and accounted for its origin by supposing that it was deposited, along with chalcedony and other siliceous minerals, from hot alkaline springs which arose in the volcanic neck 'long after the volcanic forces had spent their vigour.' The hot alkaline water acted on the rock sides and penetrated the ground of the rock, dissolving mineral matter from the mass, and re-depositing it in the gas-vesicles and veins. In 1885 hullite was again examined, on this occasion by Lacroix, who also determined it to be a secondary mineral related to the decomposition-products of olivine. Latterly, in 1895, Professor Cole reviewed the opinions of Hardman, Hull, Heddle, and Lacroix, and, setting aside the idea that hullite is a 'secondary mineral' at all, described it as 'a basic glass that has become soft and "gummy" by alteration.'

3. In considering the above interpretations of observed facts, we may class the theories for the origin of hullite into three distinct groups. These are:—

(1). THE IGNEOUS THEORY (supported by Scouler, Portlock, and Du Noyer), that hullite is a glassy substance *like* 'pitchstone' or 'obsidian,' and was probably formed during the last stages of the rock's solidifying.

(2). THE MINERAL THEORY (upheld by Hardman, Heddle, Gault, and Lacroix) that hullite is a 'secondary mineral' of the green earth group, and was probably formed during the decomposition of the rock, permeated by *meteoric* waters in the ordinary course of rock-weathering, or by hot alkaline waters of *telluric* origin, under special circumstances.

(3). THE ALTERED-GLASS THEORY (presented by Professor Cole) that hullite is 'the altered and hydrated glass of the original basaltic ground-mass,' or 'a basic glass that has become soft and "gummy" by alteration;' it was formed in the first place by igneous fusion, but has suffered subsequent transforming changes.

There is no doubt whatever that Professor Cole is correct in his surmise as to the identity of the hullite lining the cavities of the rock, with the material of the ground-mass, but, with all due respect to his fine treatment of the subject, I am inclined to doubt that hullite was in the first place *simply* a volcanic glass; I believe that this substance was not only hydrous in its composition from the first, but that it has not undergone any extensive alteration since that time. In its original condition, and as still found in certain portions of the rock, the hullite might be more accurately described as a hydrous, waxy substance, intermediate in its nature between a volcanic glass and a green earth. Professor Cole compares the alteration of the original hullite to its present form, to the alteration of basaltic glass into a green "serpentinous" material; but, where the hullite is altered, I believe that the change is mostly a physical one, and only to a small extent chemical. The resemblance of

hullite to a chloritic mineral I regard as an original structure. It is closely related to the green earths, celadonite and chlorophæite, which form the 'skin' of many agates, and which originated in quite a different manner from the "serpentinous" green earths; the latter are decomposition-products, and the former are contemporaneous formations of the lava. Professor Cole compares the coating of hullite in the vesicles to 'lava-stalactites' on a small scale, 'the glassy matrix of the lava having oozed out under pressure into any cavities it could find;' but these 'stalacites' and spherical crusts of hullite possess a fibrous structure similar to the reniform or spherical growths of hæmatite and chalcedony, and I believe that the hullite was formed, to a great extent, under the guidance of active crystalline forces. The highly vesicular nature of the rock suggests the probability that that much water was present in the hot magma, and that the formation of the hullite was not purely an igneous action, but rather intermediate between igneous and hydro-thermal.

4. The extensive literature concerning hullite has rendered Carnmoney Neck historic in the annals of mineralogical geology, but of the chalcedony and other minerals found in the cavities of the rock, very little has been said or written. The Survey Memoir, for example, merely mentions the fact that 'a good deal of chalcedony occurs throughout the mass, and occasionally fills the vesicles.' Gault investigated the 'chalcedony and other siliceous minerals' generally, but did not give any detailed description of the type-vein containing them. The typical vein at Carnmoney consists of three distinct layers, or groups of layers, more or less intergrown, and representing three consecutive stages in the deposition of the mineral matter filling the vein. These are:—

(1). THE HULLITE LAYER, consisting of hullite in varying degrees of thickness from a mere film to a crust, which is never more than an inch in measurement. The usual thickness of this mineral is one-sixteenth to one-eighth of an inch. The hullite coats the rock-sides, and was the first substance deposited in the vein.

(2). THE ZEOLITIC AND CALCITIC LAYER, deposited immediately on the surface of the hullite, consists of a thin layer, occasionally of fibrous zeolites, but generally composed of calcite. The usual thickness of this layer is about one-sixteenth to one-eighth of an inch, and it is mostly much weathered. The zeolitic parts of this layer appear to consist chiefly of natrolite, and occasionally this passes into analcime. Small crystals of chabazite are also to be found in this portion of the vein. The zeolites and calcite are rarely found together, but when they occur thus, the former have been deposited upon the latter. The thin layer of calcite frequently develops sporadic crystals of that mineral ½ to ¾ of an inch in length.

(3). THE CHALCEDONIC LAYER, coating the second layer, and sometimes entirely filling the central portion of the vein. After a single layer of chalcedony had been deposited, the large sporadic crystals of calcite again appeared here and there on its surface. These crystals in turn became enveloped by a second, and by succeeding layers of the chalcedony, and the finest examples of spherical crystalline growth may be found in the latter. In such instances, there is often in the chalcedony immediately investing the calcite crystals, a zone of white, opaque, jaspery material, containing calcareous and zeolitic matter.

The Carnmoney chalcedony exhibits all the typical structures of that mineral. In colour it varies from bluish-white to bluish-grey, the latter being more translucent than the whiter varieties. A beautiful translucent specimen, with typical reniform structure, was found to have a specific gravity of 2.582. A section through the reniform chalcedony shows very well its fibrous and spherically-crystalline arrangement. The chalcedony is almost entirely composed of these 'radiate-

'acicular' fibres, but it also contains a small quantity of amorphous silica, perhaps opal. The fibrous structure becomes very apparent when a polished section is etched with hydrofluoric acid. In many instances the chalcedony passes into crystallised quartz, which has sometimes an amethystine colour. Small groups of crystallised iron pyrites occur sparingly on the surface of the chalcedony in some of the veins. Between the first and second layers of the chalcedony a very thin crust of a green earth, resembling chlorophæite, is sometimes found. The banded arrangement of the chalcedony, layer upon layer, parallel to the vein-sides, is often varied by onyx-layers of milk-opal and wax-opal, perfectly level and apparently formed under the influence of gravity. A variety of cacholong, composed of opal, with an admixture of zeolitic and chalcedonic-quartz fibres, is also found in the onyx-structures of the veins. Gault has pointed out that one kind of opal found at Carnmoney becomes very strongly phosphorescent when it is pressed against a revolving grindstone. Tribo-luminescence appears to be a marked characteristic of both chalcedony and opal. This phenomena is often observed by those who are accustomed to polish agates and other siliceous stones.

5. Mineralogical opinion on the mode of formation, or origin, of the various chalcedonies found in volcanic lavas is much divided, and on the whole, rather indefinite. One hundred years ago the early mineralogists regarded the chalcedony as a *contemporaneous* product of the lava in which it is found. To-day the general opinion, expressed in well-known text-books on geology and mineralogy, is that the chalcedony found in the cavities of volcanic lavas is a *decomposition-product* of the weathering and decomposing rock. For example, let us take the common variety of banded chalcedony known as 'agate' or 'Scotch pebble.' In the old days Jameson described agate as contemporaneous with the lava in which it is found embedded. In more recent times Heddle, who studied agate very carefully, came to the conclusion that it was purely a decomposition product formed in the ordinary course of rock-weathering. This view has been strongly upheld

during the last twenty years by J. G. Goodchild, and to-day we find a similar opinion in the fine text-book by Professor Miers.

Other writers, still pointing to rock-decomposition as the source of this 'secondary silica,' regard it as more or less a product of 'solfataric' action formed soon after the solidification of the lava. But even the standard text-books of geology are strangely indefinite in their remarks on this subject. The Carnmoney chalcedony is a very near relation to the agates found in the Scottish andesitic lavas, and bearing this in mind, we may express modern opinion as divided into two classes of theories concerning the origin of chalcedony in lavas. These are:—

(1). The Hydro-thermal or Solfataric Theory. This theory was applied to the Carnmoney chalcedony by Mr. Gault, who supposed that, long after the volcano has spent its forces, hot alkaline water was poured into the veins and percolated through the mass of the rock. These hot springs dissolved silica and other substances out of the rock-mass, and re-deposited them in the cavities and veins. He thus accounted for the origin, not only of the chalcedony, but also of the hullite and other minerals. Gault seems to have considered that a common origin must be sought to account for the formation of all the minerals found in the veins.

(2). The Epigenetic Theory. The theorists of this class hold that the chalcedony is a decomposition-product formed during the weathering of the mother rock. Rain-water falls upon the ground, and passing through the soil, which contains decaying vegetable matter, becomes charged with carbonic acid gas, and humic acid, which gives rise to carbonic acid. The dilute solutions of carbonic acid slowly percolate through the rock-mass, attacking the silicates, and become charged with carbonates of the alkalies and alkaline earths, and free silica. Labradorite, for example, loses sodium and calcium, which are removed as carbonates, and silica as silicic acid, leaving silicate of alumina behind in the form of clay. The calcium carbonate and silica are deposited in such cavities or veins as occur in the

rock, and the sodium carbonate is supposed to attack fresh silicates, setting free more silica.

Both of the above theories, it will be observed, depend upon the decomposition of the mother-rock for the supply of mineral matter deposited in the veins and vesicles. In the first case, the action of the hot alkaline waters, aided by carbonic and hydro-sulphuric acids, is supposed to have been a comparatively rapid one; while, in the second theory, the decomposition of the rock and deposition of the mineral matter in the cavities by the action of cold, slightly alkaline water, aided by carbonic and humic acids, is supposed to have extended over extremely long periods of time. G. Bischof calculated that it would require no less a time than 1,296,000 years to deposit one pound weight of amethystine quartz in this fashion.

6. It has been frequently pointed out that trap-rocks and lavas containing nodules and veins of chalcedony are for the most part much decomposed. In some cases they are completely weathered into a saponaceous green earth, from which the chalcedony may be dug out without trouble. Some geologists go so far as to say that the beauty of the chalcedonic concretions is in direct proportion to the amount of decomposition suffered by the mother-rock. I have not found this to be the case as a general rule. Agate and chalcedony in the unaltered rock are more difficult to get at, but such specimens are almost invariably much better than pieces from the weathered rock. Indeed, where the rock is very much decomposed, the chalcedony has also suffered changes, being cracked, stained, and 'devitrified.' This is the case at Carnmoney, for the finest specimens found there are extracted from the portions of the rock that have suffered the least from weathering influences. Many of the veins in this rock have suffered so much from percolating surface-waters that the zeolitic or calcitic layer has been entirely removed, and the chalcedony lost much of its native translucency. When such veins are broken open the chalcedony usually drops out because of the clear space between it and the rock-sides, and it is often found to be much weathered.

On the whole, I feel convinced that such deposits of chalcedony in volcanic lavas, and this one at Carnmoney in particular, are contemporaneous formations of the rock, and that they were formed during the last stages of the lava's cooling and drying. Furthermore, I am constrained to believe that the zeolitic or calcitic layer, and the siliceous contents of these veins and cavities, owe their origin, not to the decomposition of the mother-rock, but to the final process of its construction. In all probability the water present in the hot lava played an important part in the formation of these minerals. We may look upon this process of vein-filling in lavas as an example of the thorough economy so often exhibited in Nature. During the consolidation of the lava contraction took place, and the cracks or veins were formed. These were points of weakness in the rock—real wounds—and Nature immediately set about their healing. The residual magma—the very life-blood of the lava we might call it—was secreted into these rents, impelled more or less by physical forces, but, nevertheless, continually guided within itself by active crystalline energy. The hullite, calcite, zeolites, and chalcedony were deposited each in its order, and when the rock was cold and dry these minerals stood each in its place, and each ready to play its own part as a necessary portion of the solid earth. There is an unbroken sequence in the mineral matter from the main constituents of the lava to the chalcedony in the centre of the veins. Professor Cole has shewn that the hullite plays the part of a true groundmass in the intercrystalline spaces of the rock. Lacroix observed that the hullite has included in its formation minute crystals of felspar and magnetite; also small crystals of calcite. The calcite and zeolites follow upon the hullite, and finally the chalcedony, which in its growth has included crystals of calcite, and zeolitic matter.

7. That the calcitic or zeolitic layer of the veins is often much weathered I have already mentioned, and very often its former presence can only be inferred from the hollow pseudomorphous cavities in the chalcedony. This calcite has in some cases been re-deposited in other portions of the veins, and

occasionally minute tufts of zeolites may be found in similar positions. There is no doubt that cold, surface-waters, charged with carbonic acid, can remove calcium carbonate from the rock, and dissolve existing crystals of calcite, carrying away, in the form of bi-carbonate, considerable amounts of that mineral, and re-depositing it in other places. The formation of zeolites from felspar and from existing zeolites takes place in a similar manner, but to a much less extent; and the formation of chalcedony in this fashion appears to be a very rare occurrence. There is also no doubt that these reactions, resulting in the growth of calcite, hydrated silicates, and various forms of silica, would go on at a much faster rate, and to a much greater extent, if the cold meteoric waters were replaced by hot alkaline waters of telluric origin. These actions have their place in nature; but when we consider the molten magma from which certain lavas have been formed, containing water under immense pressure, and at a temperature far exceeding that of any solfataric water, we come to the conclusion that the residual waters of such magmas contained large quantities of silica, silicates, and carbonates in solution. As the temperature fell, the dissolved mineral matter would be secreted and deposited in the veins and cavities, in a definite sequence, according to the nature of the dissolved elements. It is natural that such secondary minerals should bear some chemical relation to the primary rock-forming minerals, because both are formed from the same magma.

The rock-forming minerals of the Carnmoney basaltic andesite are augite, labradorite felspar and magnetite. Augite is composed mainly of calcium, magnesium, aluminium, and iron silicates, the silica amounting to 47-48 per cent. In the hullite we find hydrous silicates of the same elements, iron being the preponderating element. When the water of hydration is omitted from the analysis the silica amounts to almost 46 per cent. The primary augite and magnetite have thus a secondary counterpart in the hullite. Labradorite is composed of aluminium, calcium, and sodium silicates; the silica amounting to 52-53 per cent. In natrolite (the most common zeolite in

this rock) we have a hydrous silicate of aluminium and sodium. When the water of hydration is omitted from the analysis the silica amounts to 52 per cent. The natrolite occasionally passes into analcime, which is a more acid, hydrous silicate of aluminium and sodium. In these zeolites the aluminium and sodium silicates of the felspar have a secondary representation, and the calcium silicate of that primary mineral has its secondary counterpart in the calcite and the free silica of the chalcedony.

8. From this point of view it is evident that we cannot draw the line very finely between the terms primary and secondary, if we regard the former as applied to minerals of igneous origin, and the latter as applied to minerals of aqueous (hydro-thermal) origin. In the formation of such rocks, and the mineral contents of their veins, there is an unbroken sequence of action from igneous to hydro-thermal, and it is possible that a mineral might be formed by a process which is neither a purely igneous one nor purely an aqueous action. We see this in the case of hullite, which, from one point of view, has been described as a basic volcanic glass of igneous origin, and from another as a hydrous green earth of aqueous origin.

There is a certain amount of truth in each aspect, and the truth in both cannot be reconciled by regarding the hullite, on the one hand, as a volcanic glass altered to a green earth material, or, on the other, as a member of the green earth family derived by solution and decomposition from the primary minerals in the rock. It is more likely that from the beginning the hullite was by nature both a volcanic glass and a green earth. Mineralogists do not seem to have made a clear enough distinction between the two great sources of 'secondary' minerals in lavas—1st, deposition from the residual waters of the molten magma, and 2nd. deposition from percolating waters in the weathering rock. The action in both cases is an aqueous process, and, therefore, there is a great resemblance, often an identity, between the minerals formed in each way; but there is a difference in the time of formation and the quantities formed. The first action, at a high temperature, is rapid; the

second, at a low temperature, slow. By the first action such minerals as the zeolites, chalcedony, and opal are deposited in large quantities, whereas by the second action these substances are formed in comparatively small amounts. By the second process calcium and magnesium carbonates are often deposited extensively, because of their easy solubility as bi-carbonates in cold, meteoric waters, but the deposits of the same minerals from the hot residual waters of the cooling lava are often still more extensive. In the case of the 'green earths,' we find that minerals of this class, which are composed of the *extremely insoluble* silicates of aluminium, iron, and magnesium with varying quantities of the alkaline silicates, are usually the first substances deposited from the hot, residual waters of the lava. They are found almost invariably coating the rock-sides of veins and vesicular cavities of volcanic rocks. Such deposits are not extensive, because of the insolubility of these silicates. On the other hand, we find vast deposits of "serpentinous" and saponaceous green earths formed by the decomposition of certain lavas. In some cases the whole rock has weathered to a green earth. This substance consists chiefly of the above-mentioned insoluble silicates, with small quantities of the alkaline silicates held chemically-bound in the form of insoluble double silicates, and is really the residue of the rock, the more soluble substances having been removed by acid meteoric waters in the course of weathering. This course is a slow one, and most of the mineral matter thus removed is carried away in spring and river waters. Re-deposition on a large scale is rare in such rocks. When a volcanic rock has suffered from solfataric action, or hydro-thermal metamorphism, such green earths are also formed, not only as residues through the removal of the more soluble elements in the rock, but, also where the latter are re-deposited there is often a re-deposition of the green earths in smaller quantities.

9. The deposition of mineral matter from the residual waters of volcanic magmas, which we have regarded as the source of the Carnmoney chalcedony, accounts for the formation of the main masses of 'secondary' siliceous minerals in the veins

and cavities of most volcanic lavas. We have, for example, the zeolites in the basalts and dolerites, the agates and chalcedonies in the andesites and trap-rocks, and also the opals and hyalites in rocks of acid composition, such as rhyolites.

In describing the formation of the deposits in the typical Carnmoney vein, I have chosen them as a type of such for two reasons; firstly, because, as already explained, they exhibit clearly the continuity between the igneous formation of the mother-rock and the aqueous formation (hydro-thermal) of the contained secondary minerals, and, secondly, because, as I now briefly mention, they show, in beautiful sequence, the law of order in the separation of secondary minerals in such lavas. This law may be expressed in the following terms:—With the fall of temperature in the residual waters of cooling volcanic lavas there is a sequence of separation in the 'secondary' minerals deposited from such waters in the veins and cavities of the rock. These minerals fall into three groups which are deposited in the following order:—1st. Hydrous Earthy Silicates, and Oxides (including the green earths, such as Celadonite, Hullite, Chlorophæite, Delessite, etc., and the Oxides of Iron and Manganese); 2nd. Hydrous Crystalline Silicates and Carbonates (including the Zeolite family, and the Carbonates of Manganese, Iron, Magnesium, and Calcium); and 3rd, Crystalline and Hydrous Silica (including Quartz, Chalcedony, Hyalite, and Opal). These three groups are frequently intergrown, and often one, or two, of the groups are not represented at all.

The typical Carnmoney vein exhibits all the three groups distinctly, and is, on that account, a good type and example of such formations. As further examples of the working of this law, I shall now, in conclusion, mention the formation of several Scottish deposits of chalcedony. The most common type of chalcedony in the Scottish lavas is the agate with its wonderful and varied formations. In this case the outer layer is of green earth, and is generally composed of celadonite (or *celedonite)*, chlorophæite or saponite. Upon this we find the second layer, which is occasionally of calcite, but commonly of the zeolites, natrolite, and heulandite. The central portion of the cavity,

forming the third layer, is the agate proper, which is composed of chalcedony (of many colours), 'white agate,' cacholong, opal, and crystalline quartz (usually amethyst), arranged in concentric or level bands according to the nature of the siliceous material. The intergrowth of the green earth with the chalcedony produces the well-known moss-agates; and of iron-oxide with the chalcedony produces the equally beautiful jaspers, with their stellar, flammate, and pseudo-brecciate crystallisations. At Hillend, on the Pentland Hills (near Edinburgh) an interesting variation of agate-building occurs in the cavities of an andesite. The usual green-earth layer is present; in this case of celadonite and saponite, and as a second layer, in place of the zeolites, is a deposit of dolomite, in a beautiful ramifying form, covered by calcite, and within the latter is the third layer of chalcedony (carnelian). A similar sequence of deposition is found in the agates of Monzie (near Crieff, in Perthshire), described by Mr. Kerr as 'amœboid' agates. In this case the green earth is not found at all, but its place is taken by a layer of iron oxide, upon which the second layer of pearlspar has been deposited. Within the pearlspar or dolomite is found the third deposit of siliceous substance, constituting the agate of banded structure, with various layers of chalcedony, quartz, etc. Mr. Kerr suggests that these nodules have grown from the centre to the exterior, and from within rather than from without; but there is little doubt, I think, that these growths have been formed according to the sequence laid down in the above-mentioned law, and that the 'hollow spherical depressions' on the exterior of the Monzie type of agate, revealed by the weathering, or etching away of the exterior layers of iron oxide and pearlspar, are exactly analogous to the hollow pseudomorphous cavities on the exterior of the Carnmoney chalcedony.

DESCRIPTION OF PLATE.

Figure I.—Typical specimen of chalcedony from Carnmoney Neck, showing the characteristic reniform or spherical crystallisation of the mineral; the section through the spherical concretion to the right shows the central crystal of calcite invested by a zone of white zeolitic chalcedony.

Figure II.—Exterior surface of chalcedony from Carnmoney, showing the hollow pseudomorphous cavities formerly occupied by calcite and zeolites.

Figure III.—Typical vein of banded chalcedony from Carnmoney, showing a portion of the rock with the usual thin layer of calcite and hullite between the former and the latter. This structure is most clearly seen, where a small quantity of hullite is almost completely surrounded by the chalcedony. The thin white layer between the dark hullite and the chalcedony is composed of calcite.

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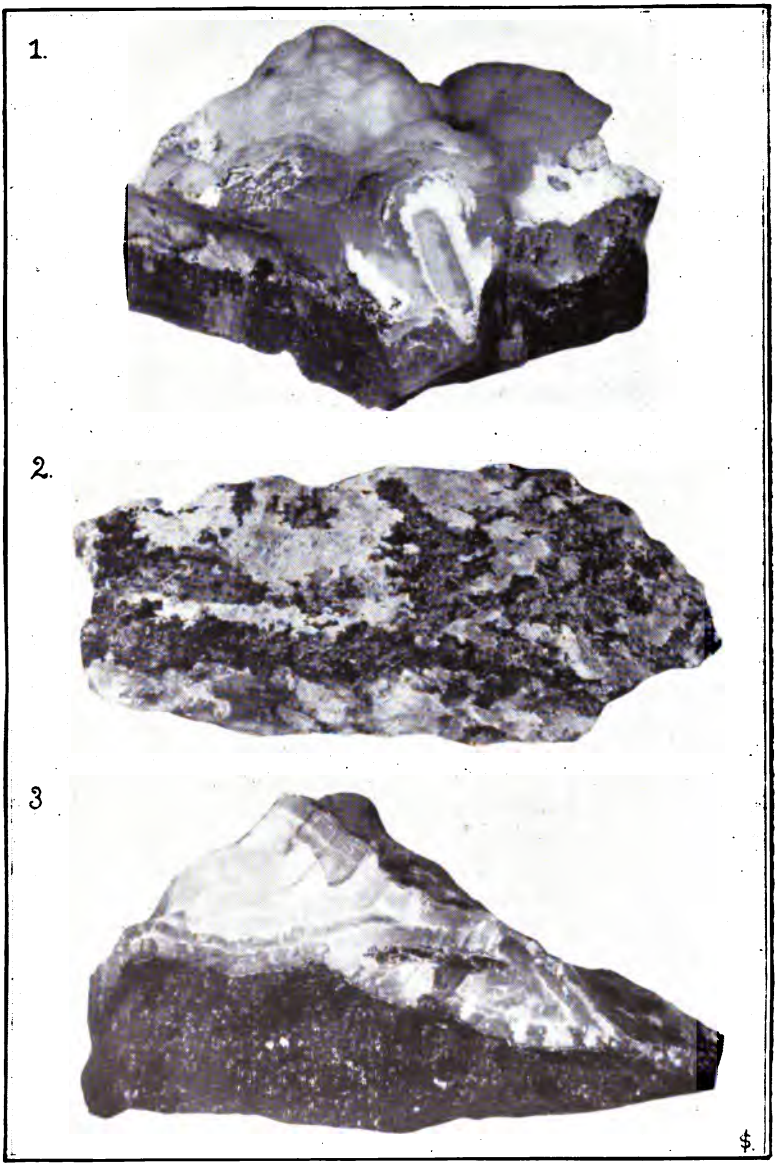

PHOTO J. STRACHAN.

SPECIMENS OF CARNMONEY CHALCEDONY.

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6. It has been frequently pointed out that trap-rocks and lavas containing nodules and veins of chalcedony are for the most part much decomposed. In some cases they are completely weathered into a saponaceous green earth, from which the chalcedony may be dug out without trouble. Some geologists go so far as to say that the beauty of the chalcedonic concretions is in direct proportion to the amount of decomposition suffered by the mother-rock. I have not found this to be the case as a general rule. Agate and chalcedony in the unaltered rock are more difficult to get at, but such specimens are almost invariably much better than pieces from the weathered rock. Indeed, where the rock is very much decomposed, the chalcedony has also suffered changes, being cracked, stained, and 'devitrified.' This is the case at Carnmoney, for the finest specimens found there are extracted from the portions of the rock that have suffered the least from weathering influences. Many of the veins in this rock have suffered so much from percolating surface-waters that the zeolitic or calcitic layer has been entirely removed, and the chalcedony lost much of its native translucency. When such veins are broken open the chalcedony usually drops out because of the clear space between it and the rock-sides, and it is often found to be much weathered.

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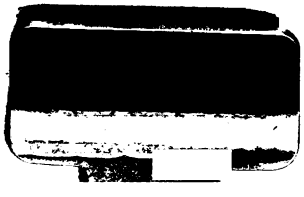

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